Renewable Arizona: Restoration Design Energy Project

Draft Environmental Impact Statement

Volume II of II

February 2012

BLM

Arizona State Office

MISSION STATEMENT

"To sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations."

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ACRONYMS AND ABBREVIATIONS

Acronym	Full Phrase
ACC	Arizona Corporation Commission
ACEC	area of critical environmental concern
AZ DOC	Arizona Department of Commerce
ADWR	Arizona Department of Water Resources
AMA	active management area
ANPL	Arizona Native Plant List
ARRTIS	Arizona Renewable Resource and Transmission Identification Subcommittee
ASLD	Arizona State Land Department
AUM	animal unit month
AZDA	Arizona Department of Agriculture
AZ DOR	Arizona Department of Revenue
AZGFD	Arizona Game and Fish Department
AZGS	Arizona Geological Survey
AZSITE	Arizona Archaeological Site and Survey Database
BLM	United States Department of the Interior, Bureau of Land Management
BLM-administered public lands	surface acres administered by the United States Department of the Interior, Bureau of Land Management
BLS	Bureau of Labor Statistics
BMP	best management practice
BOR	Bureau of Reclamation
CAA	Clean Air Act
CEDC	Commerce and Economic Development Commission
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO_2	carbon dioxide
CO_{2e}	carbon dioxide equivalents
CSP	concentrating solar power
CWA	Clean Water Act
dBA	A-weighted decibel
DNI	Direct Normal Irradiance
DNL	day-night average noise level
DOD	United States Department of Defense
DOE	United States Department of Energy
DOI	United States Department of the Interior
EA	environmental assessment
EIS	environmental impact statement
EMF	electromagnetic frequency
EO	Executive Order
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FLPMA	Federal Land Policy and Management Act of 1976
Forest Service	United States Department of Agriculture, Forest Service

FY	fiscal year
GHG	greenhouse gases
GIS	geographic information system
GLO	General Land Office
GW	gigawatt
GWh	gigawatt-hour
HA	herd area
HMA	herd management area
INA	Irrigation Non-expansion Areas
KOP	key observation point
kV	kilovolt
LAUS	Local Area Unemployment Statistics
L_{DN}	day-night average sound level
L_{EQ}	equivalent sound pressure level
L_{10}	noise level exceeded 10 percent of the time
L_{50}	noise level exceeded 50 percent of the time
L_{90}	noise level exceeded 90 percent of the time
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MCL	maximum contaminant level
MOU	Memorandum of Understanding
MTR	Military Training Route
MW	megawatt
NAAQS	national ambient air quality standards
NEPA	National Environmental Policy Act
NFS	National Forest System
NHPA	National Historic Preservation Act
NLCS	National Landscape Conservation System
NPDES	National Pollutant Discharge Elimination System
NPS	United States Department of the Interior, National Park Service
NRA	National Recreation Area
NRCS	United States Department of Agriculture, Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWRS	National Wildlife Refuge System
OES	Occupational Employment Statistics
OHV	off-highway vehicle
O&M	Operations and Maintenance
PEIS	programmatic environmental impact statement
PFYC	Potential Fossil Yield Classification

planning area	State of Arizona, including all lands, regardless of land ownership
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
POD	plan of development
ppb	parts per billion
ppm	parts per million
PSD	Prevention of Significant Deterioration
PV	photovoltaic
RDEP	Restoration Design Energy Project
REDA	renewable energy development area
RFDS	Reasonably Foreseeable Development Scenario
RMP	Resource Management Plan
ROD	Record of Decision
ROW	right-of-way
RMZ	recreation management zone
RPS	Renewable Portfolio Standard
SDWA	Safe Drinking Water Act
SEZ	Solar Energy Zone (utility-scale solar)
SGCN	species of greatest conservation need
SHPO	State Historic Preservation Office
SRMA	special recreation management area
SOC	Standard Occupation Classification
SUA	special use area
SWA	State Wildlife Area
SWreGAP	Southwest Regional GAP Analysis Project
TCP	traditional cultural property
$\mu g/m^3$	micrograms per cubic meter
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VRI	visual resource inventory
VRM	visual resource management
WHA	Wildlife Habitat Area
WPZ	Water Protection Zone
WREZ	Western Renewable Energy Zones
WSA	wilderness study area
YPG	U.S. Army Yuma Proving Ground

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RESOURCE POTENTIAL AND REASONABLY FORESEEABLE DEVELOPMENT SCENARIO REPORT

RESTORATION DESIGN ENERGY PROJECT

United States Department of the Interior
Bureau of Land Management
Arizona State Office

July 2011

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ACRONYMS

ARRTIS	Arizona Renewable Resource and Transmission Identification Subcommittee
BLM	Bureau of Land Management
CSP	concentrating solar power
EIS	Environmental Impact Statement
GIS	geographical information systems
GW	gigawatt
GWh	gigawatt-hour
kWh	kilowatt hour
m^2	
MW	megawatt
MWh	megawatt hour
NREL	Department of Energy's National Renewable Energy Laboratory
PV	photovoltaic
RDEP	Restoration Design Energy Project
RFD	Reasonably Foreseeable Development Scenario
RPS	Renewable Portfolio Standard
US	United States

RESOURCE POTENTIAL AND REASONABLY FORESEEABLE DEVELOPMENT SCENARIO

INTRODUCTION

The following Reasonably Foreseeable Development Scenario (RFD) has been prepared in support of the United States (US) Department of the Interior, Bureau of Land Management (BLM) Restoration Design Energy Project (RDEP) Environmental Impact Statement (EIS). The BLM action associated with the RDEP is the amendment of BLM land use plans to make disturbed or previously developed sites or areas available for renewable energy projects. Arizona has ample solar and wind resources to meet and exceed its statewide target of sourcing 15 percent of electricity sales from renewable energy by 2025 (Black and Veatch 2007). Statewide electricity sales in 2025 are estimated to be 94,295 gigawatt-hours (GWh). Taking into account energy used or lost in production and transmission (12.5 percent), Arizona would meet this target by generating 15,912 GWh from renewable energy resources. The BLM manages approximately 17 percent of lands within Arizona and is expected to be involved in a significant portion of Arizona's renewable energy future. With proactive planning, renewable energy production can be developed in a manner that minimizes impacts on natural resources and the human environment.

The RFD identifies the lands in Arizona that are likely most suitable for the development of solar and wind energy resources, and estimates the electrical energy generating capacity of those lands should they be developed. This RFD is neither a planning decision nor the "No Action Alternative" in the EIS; it serves as a technical document to be used as a reference.

The RFD process was originally designed for estimating the projected levels of fluid mineral (e.g., oil, gas, and geothermal) activity within a given area over a given timeframe (typically 15 to 20 years) to aid in the preparation of land use plans and associated environmental reviews. This RFD provides a similar purpose by assessing the potential levels of development for renewable energy resources.

Developing an RFD requires a series of assumptions about future development; these assumptions include evolution of technologies,

energy policy, economic growth, and the cost of energy in the future, among others. Uncertainties due to assumptions are amplified when dealing with unproven and yet-to-be commercialized technologies. For the purpose of this RFD, only known, proven, and currently used commercial-scale renewable energy types were considered in the estimations provided. Those technologies meeting these criteria are direct-fired biomass, biomass co-firing, landfill gas, anaerobic digestion, solar thermal electric, hydroelectric, wind, and geothermal. Of these energy types, solar (both concentrating solar power [CSP] and photovoltaic [PV] technologies) and wind are identified as having by far the greatest potential of development through 2025 (Black and Veatch 2007), and are the only energy types carried forward in this report. Other forms of renewable energy technology, such as algae-based fuel production, are currently under research and development, and have the potential to be deployed at commercial scale in the future. However, it is difficult to forecast which of these technologies will reach commercial-scale deployment and what proportion of the future energy landscape they will represent; as such, these technologies are excluded from this document.

While Arizona has potential for rooftop solar and cogeneration of renewable energy along with conventional energy production facilities, the scope of this analysis is limited to on-the-ground commercial-scale renewable energy projects.

This document provides an overview of the purpose of the RFD, an overview of wind and solar technologies assumed to be used under this RFD, a survey of similar assessments done in Arizona, the methodology used for preparing the RFD, the results of the analysis, and conclusions. Maps and acreages are provided along with descriptions identifying patterns and trends observed in the results.

PURPOSE OF RFD

This RFD was prepared for the following purposes:

- To inform policy makers. Policy makers, including land management agencies such as the BLM, develop landscape-level approaches to determine the allowable uses of lands. The RFD informs these parties of which areas are most suitable for energy projects from both technical and environmental standpoints so they are better prepared for land use planning efforts.
- To inform decision makers. Decision makers are involved at all levels of development, from large-scale planning processes all the way through site-specific project approvals. An RFD allows a decision maker to see how an

individual proposed project might fit into the energy and environmental landscape, and allows him or her to make a decision that takes into account big-picture, planning-level considerations.

- To inform the general public. The general public is a major force in creating political pressure that can directly affect the approval or denial of a local project proposal. An RFD allows the public to understand their local resources in the context of the state as a whole. Having this context can help local residents to submit informed opinions to political representatives or decision makers during an environmental review process or other public hearing for future projects that may be proposed in their community.
- To inform developers. Energy developers are typically looking to site a project for the maximum energy production at the lowest possible cost. An RFD shows developers a range of options for siting their projects in technically suitable locations with minimal environmental constraints. While local issues are not identified in the RFD, this document is intended to provide an initial screening of major environmental constraints. Informed developers save time, money, and are able to launch smarter outreach to communities and stakeholders.

Overview of Renewable Energy Technologies

Solar

Solar radiation may be harnessed through various technologies and transformed to usable energy, such as heat and electricity. This section examines the large-scale commercial applications of solar energy capture. Two basic solar energy technologies that produce electrical power are CSP systems and PV systems.

Concentrating Solar Power Systems

CSP technologies use mirrors to concentrate sunlight onto receivers that convert it to heat. The thermal energy is then used to drive a generator via steam turbine or heat engine to produce electricity. CSP technologies are the most suitable solar technologies for large utility-scale applications. The three main types of CSP technologies are linear concentrator, dish/engine, and power tower systems. CSP technologies require cooling of the exhaust steam so that it condenses back into water before being heated again into steam. Wet cooling is many times more efficient than dry cooling and uses 500 to 800 gallons of water per megawatt hour (MWh) (Solar Energy Industries Association 2010).

Linear Concentrator Systems

Linear CSP systems use a large field of long, rectangular, U-shaped mirrors tilted toward the sun that capture and focus solar energy onto linear receiver tubes that run along the length of the mirrors. The receiver contains a fluid (oil or water) that is heated by the sunlight and used to boil water in a steam-turbine generator to produce electricity.

The two major types of linear CSP systems are parabolic trough systems and linear Fresnel reflector systems. Parabolic trough systems are the predominant CSP systems currently operating in the US. They use collectors in which the receiver tube is positioned along the focal line of each parabolic mirror. Currently the largest individual trough systems generate 80 megawatt (MW) of electricity.

In linear Fresnel reflector systems, the receiver tube is positioned above several flat or slightly curved mirrors that are mounted on tracking structures. In some systems, a small parabolic mirror may be added atop the receiver to further focus the sun's rays.

Dish/Engine Systems

The dish/engine system produces relatively small amounts of electricity (3 to 25 kilowatts) compared to other types of CSP technologies. It uses a parabolic mirrored dish similar to a large satellite to concentrate sunlight onto a thermal receiver. The thermal receiver, mounted at the focal point of the dish, absorbs and transfers the heat to an engine or generator. The most common type of heat engine used today in dish/engine systems is the Stirling engine. A Stirling engine uses the fluid heated by the receiver to move pistons and create mechanical power. Mechanical work turns a crankshaft that drives a generator to produce electricity. To maximize the amount of solar energy captured by the dish/engine collectors, the dish assembly is mounted on a tracking structure that follows the sun across the sky.

Power Tower Systems

Power tower systems use a large field of flat, sun-tracking mirrors, known as heliostats, to focus sunlight onto a receiver, which is located atop a tower. A fluid in the receiver, either water or molten nitrate salt, is heated and used to generate steam, which, in turn, is used in a conventional turbine generator to produce electricity. The molten nitrate salt has heat-transfer and energy-storage capabilities, which allows for continued production of electricity during cloudy weather and at night.

Photovoltaic Systems

PV systems use solar cells consisting of semiconductor materials similar to those used in computer chips to capture the energy in sunlight and convert it directly into electricity. PV systems must be scaled over a

very large area in order to be effective for utility-scale applications. Due to the high cost of PV cell production, large PV electrical generating systems are less likely to be used in commercial utility application. PV systems are generally used to provide power to individual homes and small buildings. They are also found in rural areas on communication towers, water pumps, and road and traffic signs.

The process by which a PV cell converts sunlight into electricity is called the photoelectric effect. Through this process, the sunlight absorbed by the semiconductor material knocks electrons loose from their atoms, allowing them to flow through the material and generate electric current.

There are three main types of materials used for solar cells. Traditional solar cells are made from silicon. These cells are usually flat-plate and are the most efficient. The second type is the thin-film solar cell made from amorphous silicon or non-silicon materials, such as cadmium telluride. The third and newest type of solar cell is made from a variety of new materials besides silicon, including solar inks, solar dyes, and conductive plastics. Some new solar cells use plastic lenses or mirrors to concentrate sunlight onto high-efficiency PV materials. These systems are cost effective for use in utility-scale applications because they produce a significant amount of energy using smaller quantities of more efficient, albeit more expensive, materials (NREL 2010a).

PV cells are connected into units to form PV modules, which in turn are combined to make PV arrays. The size of an array depends on the amount of sunlight and the needs of the customer. For utility-scale electricity generation, hundreds of arrays are interconnected to form a single large system. Modules and arrays are often combined with other components, such as those that convert the current within the cell material to usable electricity, batteries to store some of the electricity, and mounting structures that point them toward the sun. These components, referred to as the balance-of-system components, combined with modules and arrays create a complete PV system. There are two types of PV systems in use today: flat-plate systems and concentrated PV systems.

Water requirements for PV systems are approximately 20 gallons per MWh for the purpose of cleaning solar panels (Solar Energy Industries Association 2010). In some operations where water availability is especially limited, a PV operator may choose not to wash the panels at all, eliminating water consumption altogether.

Flat-plate Photovoltaic Systems

The most common array designs use flat-plate PV panels, which can either be fixed in place or allowed to track the sun. These panels

respond to both diffuse and direct solar radiation, making them useful even on cloudy days when the diffuse radiation accounts for nearly 100 percent of the total radiation. On a sunny day, an estimated 10 to 20 percent of the total solar radiation comes from the diffuse component of sunlight.

Generally, flat-plate PV panels are mounted on stationary structures with a tilt at a fixed angle determined by the latitude of the site, the requirement of the load, and the availability of sunlight. The fixed arrays are advantageous in that they are simple, inexpensive, and lightweight. However, because their orientation to the sun is fixed, often at a less than optimal angle, they receive less energy per unit area compared with a tracking array. The flat-plate tracking arrays are primarily mounted on one-axis tracking structures, which are designed to track the sun from east to west.

Concentrated Photovoltaic Systems

Concentrated PV systems use lenses or mirrors to concentrate sunlight on solar cells. The concentration of sunlight allows for greater efficiency and reduction in size and number of cells. These systems must track the sun to keep light focused on the PV cells. They are primarily mounted on two-axis tracking structures, which are designed to track the sun's daily and seasonal course. One-axis tracking systems are also sometimes used.

Both reflectors and lenses have been used to concentrate light for PV systems. The most promising lens for concentrated PV application is the Fresnel lens, which uses a miniature saw tooth design to focus incoming light. The best lenses, however, can transmit only 90 to 95 percent, and in practice even less, of incident light. In addition, lenses cannot focus diffuse sunlight, which makes up nearly 10 to 20 percent of the radiation on a clear day.

While concentrated PV systems lower costs by reducing PV material needs, they require sophisticated tracking devices and expensive concentrating optics. High concentration ratios also introduce an excessive heat, which can decrease cell efficiencies and damage solar cells.

Wind

A wind turbine is a mechanical assembly that converts the energy of wind into electricity. A wind turbine consists of a blade or rotor, a drive train (usually including a gearbox and a generator), a tower, and other equipment, including controls, electrical cables, ground support equipment, and interconnection equipment. The blades turn in the moving air and power an electric generator that supplies an electric current. The blades act much like an airplane wing. Blowing wind causes

a pocket of low-pressure air to form on the downwind side of the blade, which in turn causes the blade to be pulled toward that pocket. This force causes the rotor to spin like a propeller and turn a shaft. The rotational energy of the shaft turns the generator to produce electricity. Wind turbines are mounted on a tower to enable them to capture the most energy. Tower height affects the amount of power that can be extracted by a given wind turbine. At 98 feet or more above ground, wind turbines can take advantage of faster and less-turbulent wind.

Wind turbines fall into two basic groups, which include the horizontal-axis propeller-style variety, like traditional farm windmills, and the vertical-axis design, like the eggbeater-style Darrieus model. The horizontal-axis turbines are the most common, constituting nearly all the utility-scale turbines. These typically have either two or three blades. The three-blade turbines are operated upwind with their blades facing into the wind.

Wind turbines are available in a variety of sizes, and, subsequently, a variety of power ratings. Utility-scale wind turbines for land-based wind farms have rotor diameters ranging from 130 to about 395 feet, and towers that reach 130 to 425 feet high.

Utility-scale turbines range in power rating from 100 kilowatts to as large as several megawatts. Larger turbines are grouped together into wind farms, which provide bulk power to a utility power grid. Wind power plants are modular, which means they consist of small individual modules (turbines), and, depending on electricity demand, can easily modify production capacity.

BACKGROUND

While no previous known study exists that estimates the electrical generating capacity of the State of Arizona, studies do exist that estimate the lands appropriate for wind and solar development. The most recent and Arizona-specific reports are summarized below. Methodologies of other reports were reviewed and considered in the preparation of this RFD, including the BLM's 2005 Wind Energy EIS, the BLM and Department of Energy 2003 Assessment of Renewable Energy Potential on Public Lands, and the 2009 National Renewable Energy Laboratory Western Renewable Energy Zones study.

2009 Arizona Renewable Resource and Transmission Identification Subcommittee Final Report

The Southwest Area Transmission Planning Group developed the Arizona Renewable Resource and Transmission Identification Subcommittee (ARRTIS), which produced a final report in 2009. The 2009 ARRTIS Final Report identified potential constraint areas for Arizona renewable resource development. A collaborative process was

undertaken involving representatives from state and federal government, utilities, Native American tribes, environmental organizations, and development and technology companies. The report used geographical information systems (GIS) data, which involves layering maps of different data sets to provide visuals of resource distribution and potential overlaps, from state and federal government sources and from the Western Governors' Association's Western Renewable Energy Zone Initiative (Southwest Area Transmission Planning Group 2009).

The ARRTIS analysis looked at all lands with either solar or wind resource potential within Arizona and then excluded areas using various GIS data layers that would preclude the development of solar or wind projects due to either technical or environmental factors on those lands such as low wind speeds, steep slopes, wetlands, conflicting uses, or environmental protection areas. Remaining lands were further classified into "High", "Moderate", or "Low" sensitivity through the application of other GIS data layers. The final report included separate maps for wind and solar resource potential, and separate maps for wind and solar that show exclusion areas and resource sensitivity areas.

The ARRTIS report considered lands with slopes greater than five percent to be too steep to be developable with existing solar technologies and lands with slopes greater than 15 percent to be too steep to be developable with existing wind technologies.

2007 Arizona Renewable Energy Assessment

Black and Veatch Corporation completed this in-depth assessment of renewable energy generation potential for three Arizona utilities (Arizona Public Service, the Salt River Project, and Tucson Electric Power) that must comply with Arizona's Renewable Energy Standard. The purpose of the report was to assess the prospects for significant renewable energy development in Arizona. The study includes a review of the current status of renewable energy in Arizona, characterization of renewable power generation technologies, and an assessment of Arizona's renewable resources.

2007 Arizona Wind Energy Assessment

In 2007, the Arizona Wind Working Group produced Arizona Wind Energy Assessments for eight Arizona counties. Each report determined the amount of "developable windy land." The analysis used the TrueWind map acquired by Northern Arizona University in 2003. Similar to the ARRTIS report, the working group undertook a process of excluding lands via the application of GIS data layers. The exclusions were both technical and environmental in nature, and once applied, resulted in a remaining set of lands categorized as "developable windy

land." The report examined longer-term potential, taking into consideration advances in wind technology that would enable production on steeper slopes. Lands with slopes of 20 percent or less were considered developable over the long term (Arizona Wind Working Group 2007), in comparison to the slope of 15 percent, which was used as the maximum slope in the ARRTIS analysis.

2010 Solar Energy Development Programmatic Environmental Impact Statement

At the time of this writing, the BLM is preparing a Programmatic EIS to "evaluate utility-scale solar energy development, to develop and implement Agency-specific programs that would establish environmental policies and mitigation strategies for solar energy projects, and to amend relevant BLM land use plans with the consideration of establishing a new BLM solar energy development program."

The Programmatic EIS covers six states and includes a two-tiered RFD approach for Arizona. The first RFD approach employed the solar component of Department of Energy's National Renewable Energy Laboratory's (NREL) Regional Energy Deployment System model, which estimated the role of all energy types in the US through 2050. The second RFD approach used the Arizona Renewable Portfolio Standard (RPS). The Arizona RPS requires that 15 percent of energy produced in the state be from renewable sources by 2025. This RPS-based approach uses this 15 percent renewable energy generation as a starting point and calculated how many acres of land would be required for solar projects to satisfy this mandate.

Throughout the development of the RDEP RFD and EIS, the project team has stayed in close communication with the Solar PEIS project management team, sharing methodologies, resources, and lessons learned, and ensuring that the solar energy zones being identified in the Solar PEIS are included within the RDEP RFD area.

METHODOLOGY

This report provides resource potential summaries and RFDs for solar and wind energy on lands within the State of Arizona. Resource potential and RFDs are provided both for the State as a whole, regardless of land ownership, and for BLM-managed lands only. This report serves as both a guide for solar and wind energy development in Arizona and as a basis for the environmental analysis in the RDEP EIS.

Resource Potential Summaries

Resource potential maps for solar and wind were developed for both the State of Arizona and for BLM-administered lands within the State.

Given the broad presence of solar energy resources across the State of Arizona, this analysis assumes production can occur anywhere and therefore focuses upon identifying lands with the greatest suitability for development. Wind resources are much more limited than solar within Arizona, so the traditional approach of pinpointing these known resource areas is employed with the same focus on identifying which lands in those areas are most suitable for development.

Solar

For solar energy, existing solar intensity data maps produced by NREL were examined for Arizona. It was determined that the entire state receives enough solar radiation for development, with annualized Direct Normal Irradiance levels of six or higher. Using GIS data layers, areas with slopes of five percent or greater were eliminated from the project map as these areas are generally considered to be undevelopable for solar energy projects using existing technologies. The remaining lands are considered to be the solar potential area of Arizona and were recorded on the Statewide Solar Potential map (**Figure 1**). The remaining lands were then narrowed down to BLM-administered lands only, resulting in the BLM Solar Potential map (**Figure 2**).

Each of the remaining acreages was then divided by an industry-standard factor of generation capacity per acre, resulting in an estimate of solar electricity generation capacity for both the entire State and BLM-administered lands within the State. These numbers are presented in the Results section, below.

Wind

For wind energy, existing wind resource class GIS data produced by NREL were used as a starting point. Areas with Wind Resource Class 3 ("Fair") or greater were retained as being considered developable. Using GIS data layers, areas with slopes of 15 percent or greater were then eliminated from the project map as these areas are generally considered to be economically unfeasible for wind energy projects using existing technologies. The remaining lands are considered to be the wind potential areas of Arizona and were recorded on the Statewide Wind Potential map (**Figure 3**). The remaining lands were then narrowed down to BLM-administered lands only, resulting in the BLM Wind Potential map **(Figure 4**).

Statewide Solar Potential

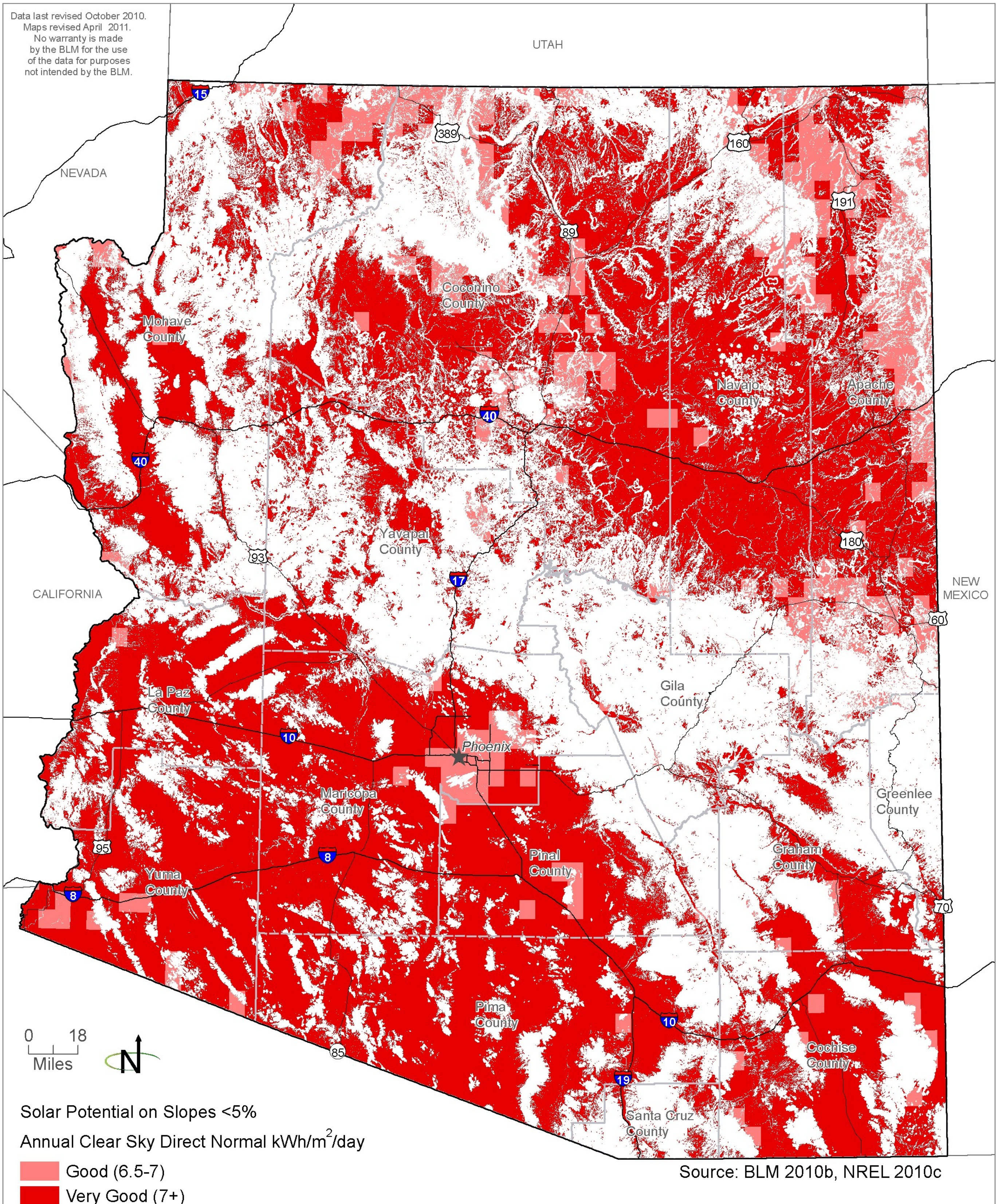


Figure 1

BLM Solar Potential

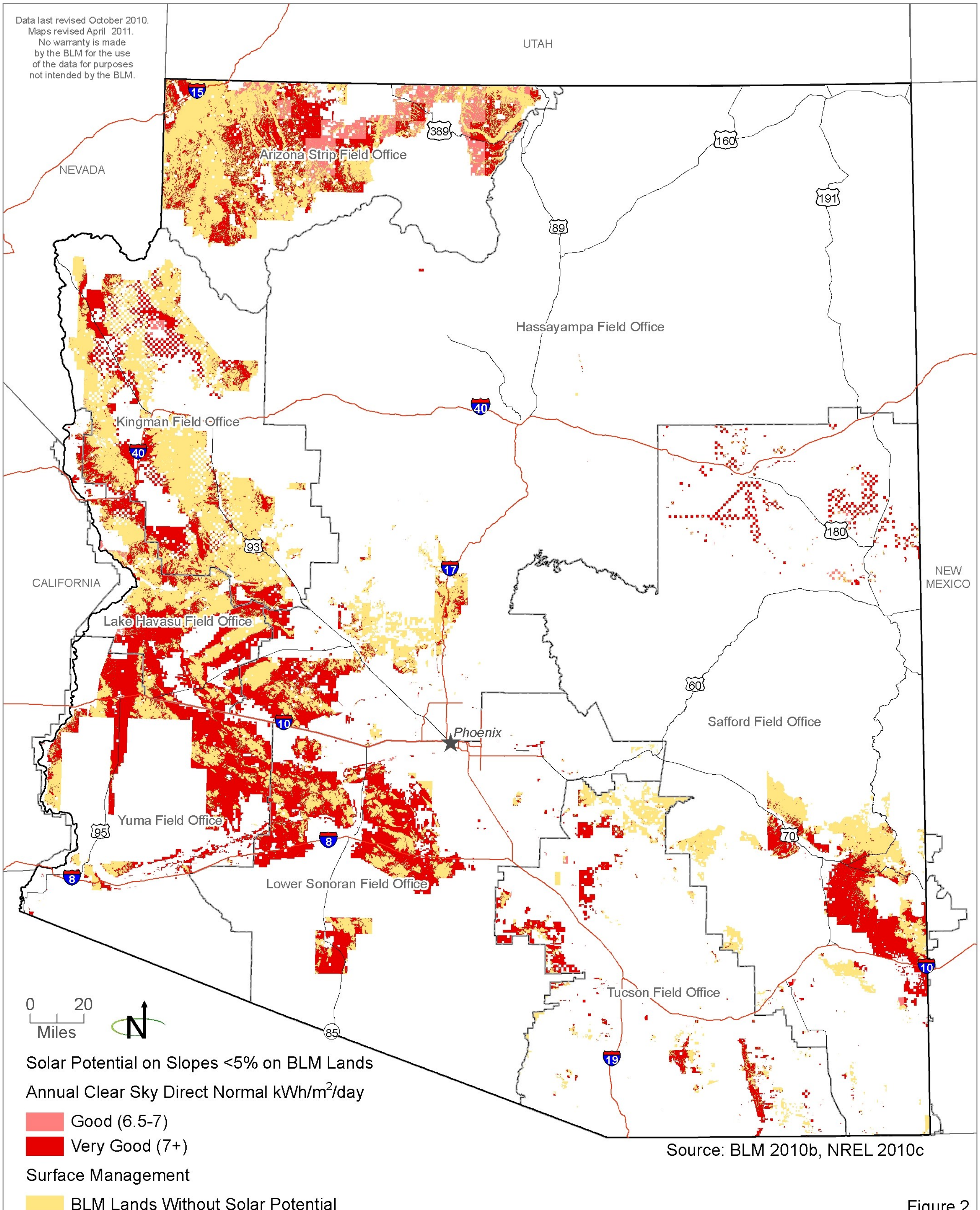


Figure 2

Statewide Wind Potential

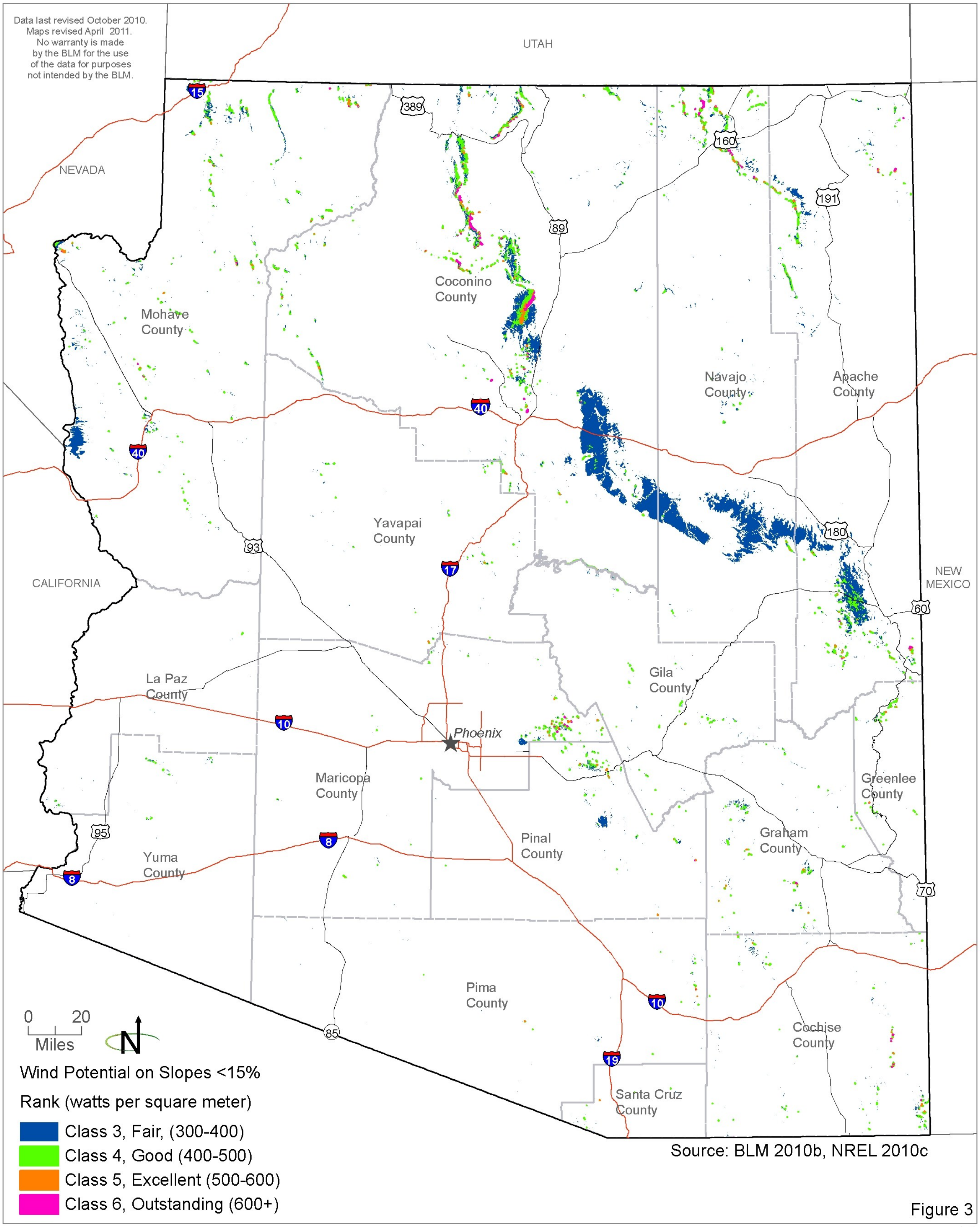
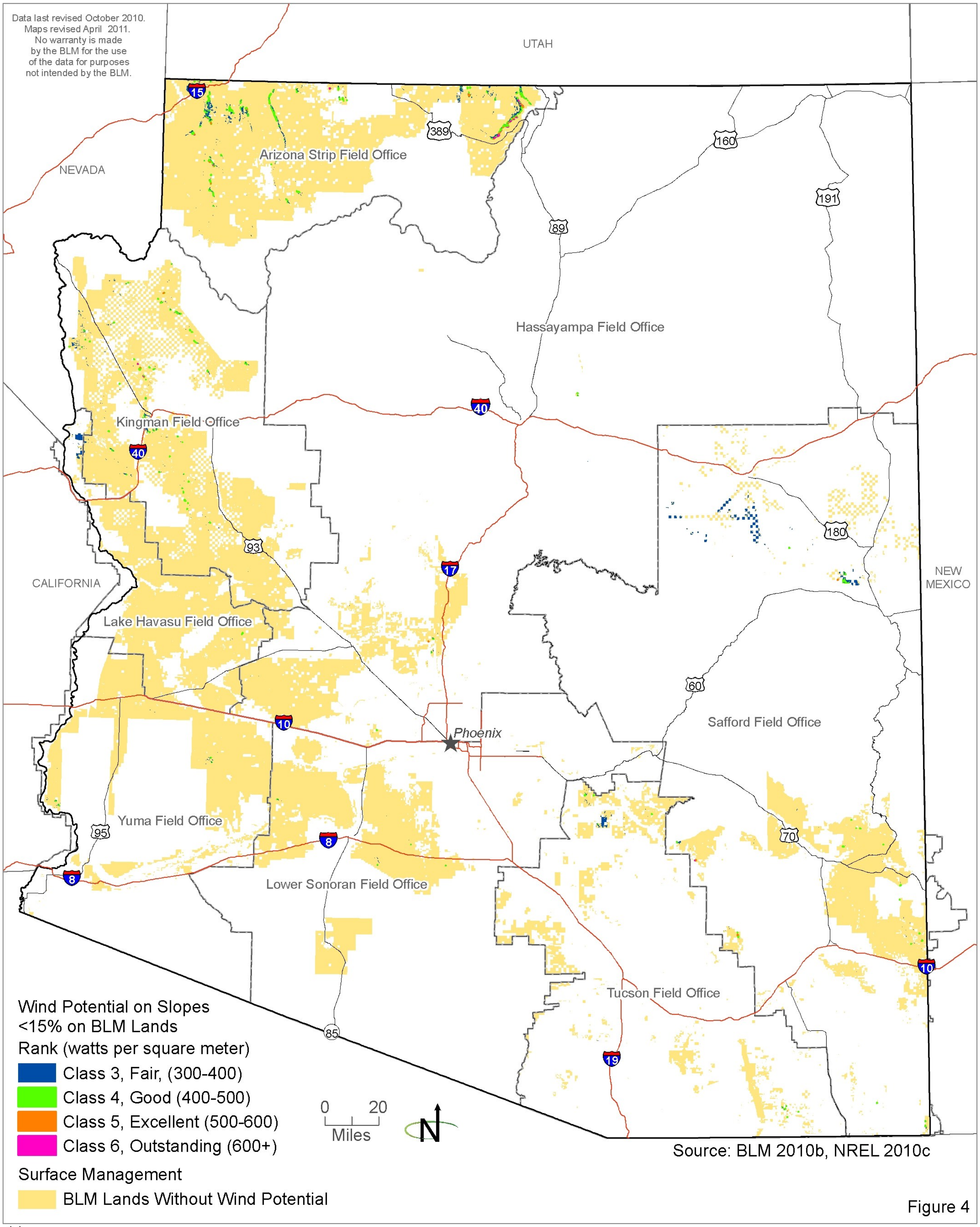


Figure 3

BLM Wind Potential



Source: BLM 2010b, NREL 2010c

Figure 4

Each of the remaining acreages was then divided by an industry-standard factor of generation capacity per acre, resulting in an estimate of wind electricity generation capacity for both the state as a whole, and for BLM-administered lands within the state. These numbers are presented in the Results section, below.

POTENTIALLY DEVELOPABLE LANDS

Potentially developable lands are those lands that have no known regulatory or technical restrictions on which energy projects could potentially be sited. These lands were identified to give an idea of the maximum electrical generation capacity of lands in Arizona that are free from such known restrictions. Methodologies to identify such lands were reviewed from the following sources:

- 2009 ARRTIS (Southwest Area Transmission Planning Group 2009);
- 2007 Arizona Wind Energy Assessment (Arizona Wind Working Group 2007); and
- Solar Energy Development Programmatic EIS (BLM 2010).

Four separate pairs of maps and acreages were developed, including two for solar (one for all lands in Arizona and one for BLM-managed lands) and two for wind (one for all lands in Arizona and one for BLM-managed lands).

Potentially Developable Lands with Solar Potential

Potentially developable lands were identified as a subset of lands with solar potential. Lands were then excluded if they were considered to be undevelopable due to technical or regulatory restrictions. The screens applied to these lands include:

- Areas greater than 50 miles[1] from existing transmission lines of 230 kilovolts or greater;
- Airports;
- Designated Wilderness Areas;
- Wilderness Study Areas;
- Established Research Natural Areas;
- Inventoried Roadless Areas;
- Military Range/Installation;

[1] The 2009 ARRTIS report considered areas within 30 miles from transmission to be "technically ideal for utility-scale generation development." This RFD has a wider scope than the ARRTIS report and assumes a wider inclusion corridor of 50 miles, which is consistent with previous BLM and Department of Energy evaluations of renewable energy potential areas.

- National Conservation Areas;
- National Historic Trails;
- National Monuments;
- National Park System units;
- Wild and Scenic Rivers;
- State Designated Habitat Conservation Areas;
- State Designated Natural Community Conservation Areas;
- Wetlands;
- Fish and Wildlife Service lands;
- Urban/Developed Areas; and
- Water bodies (including seasonal and dry lakes).

The remaining lands, recorded on **Figure 5**, are considered to be potentially developable, as they have no known technical or regulatory restrictions. The remaining lands were then narrowed down to BLM-administered lands only, resulting in Potentially Developable BLM Lands with Solar Potential (**Figure 6**).

Potentially Developable Lands with Wind Potential

Potentially developable lands were identified as a subset of lands with wind potential. Lands identified in the Statewide Wind Potential Map were screened out using GIS. Lands were excluded if they were considered to be undevelopable due to technical or regulatory restrictions.

The remaining lands are considered to be developable, as they have no known technical or regulatory restrictions. Potentially Developable Lands with Wind Potential are recorded on **Figure 7**. The remaining lands from the previous step were then narrowed down to BLM-administered lands only, resulting in Potentially Developable BLM Lands with Wind Potential (**Figure 8**).

RFDs Based on State Renewable Portfolio Standard

To complete the estimate of the level of development that is reasonably expected to occur on BLM lands, the State of Arizona RPS of 15 percent renewable electrical generation by 2025 was used as a starting point. Total electricity sales in Arizona in 2025 are estimated to be 94,295 GWh. Fifteen percent of that represents 14,144 GWh of renewable energy sales. The amount of generation required to satisfy this level of sales requires an additional 12.5 percent to account for internal use and line losses (US Energy Information Administration

Potentially Developable Lands with Solar Potential

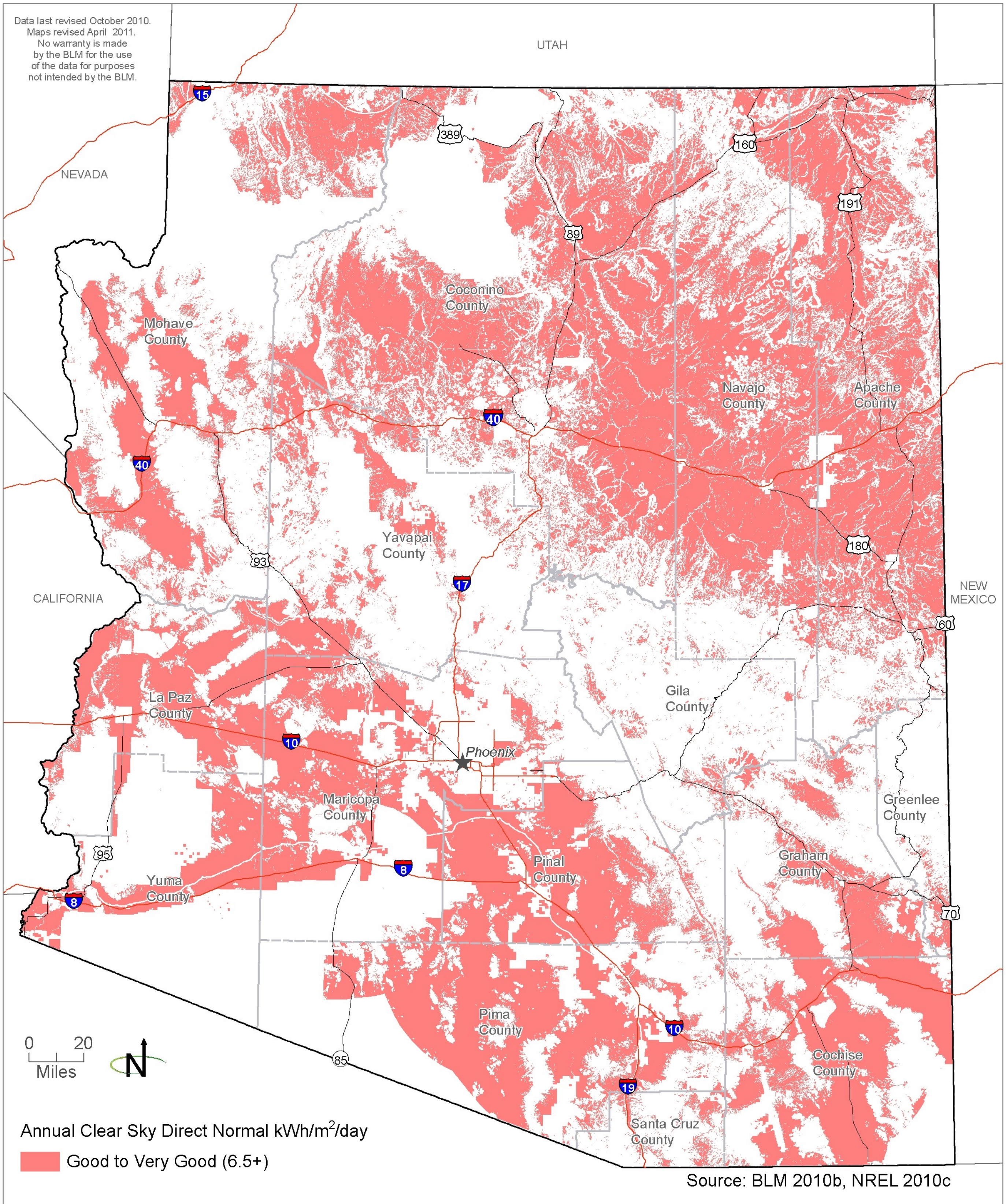


Figure 5

Potentially Developable BLM Lands with Solar Potential

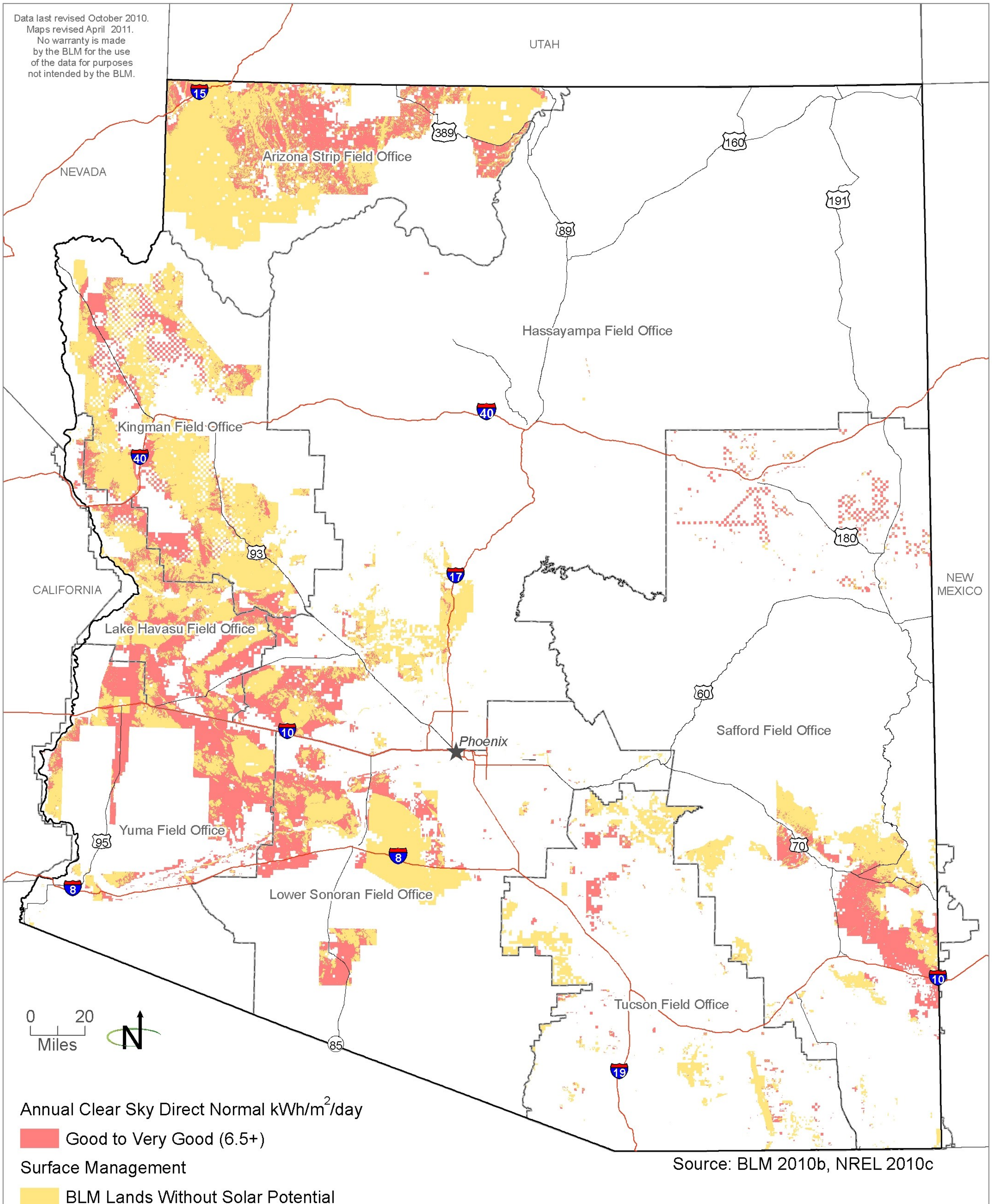
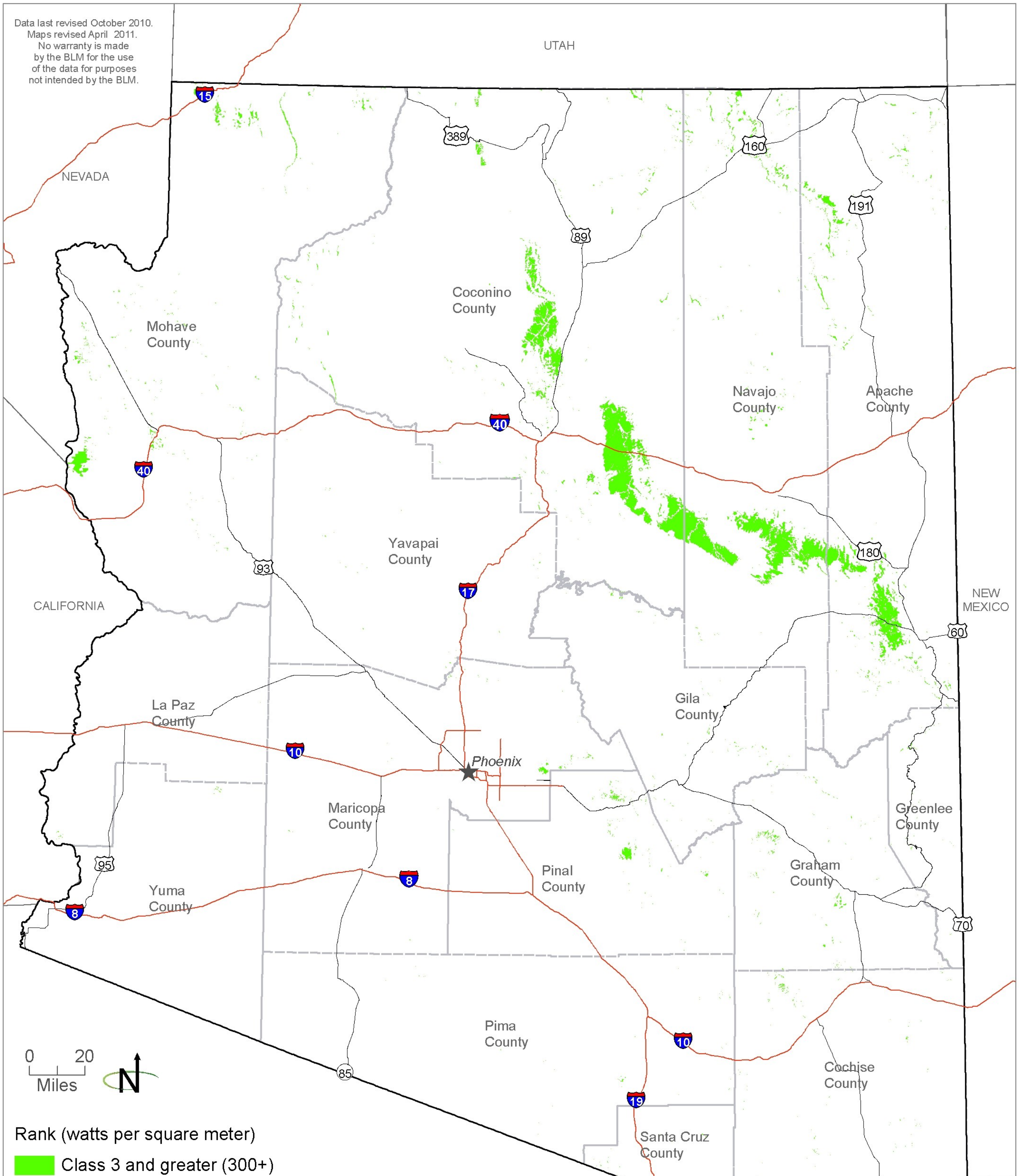


Figure 6

Potentially Developable Lands with Wind Potential



Source: BLM 2010b, NREL 2010c

Figure 7

Potentially Developable BLM Lands with Wind Potential

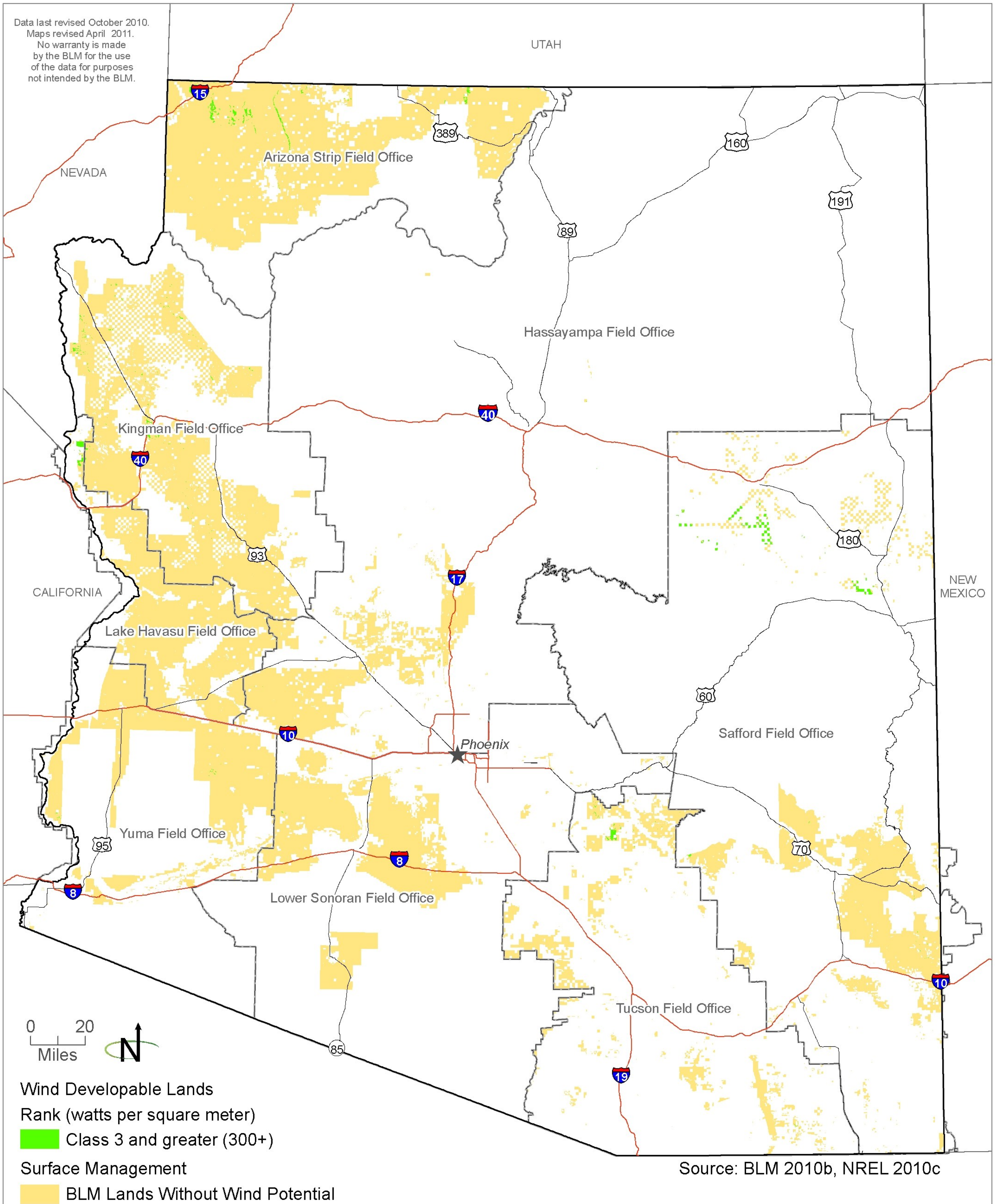


Figure 8

2008). This brings the estimated renewable generation capacity for in-state consumption in 2025 to 15,912 GWh to meet the 15 percent RPS. Arizona, given its abundance of solar energy resources, is expected to be a net exporter of renewable energy, and so, for the purposes of this RFD, it is assumed that by 2025 Arizona will generate 15,912 GWh for in-state consumption, and will generate a further 15,912 GWh for export to neighboring states. Thus, the estimated renewable electrical energy generation capacity for in-state consumption and out-of-state export in 2025 is 31,824 GWh.

The following individual solar and wind RFD calculations will use 31,824 GWh as the estimated overall renewable electrical energy generation in 2025. The goal of these calculations is to determine how much energy is expected to be produced by solar and wind, how much installed capacity would be required to produce these levels of output, and how much land disturbance would be associated with these levels of capacity.

Solar RFD

While solar energy is currently Arizona's greatest renewable energy source, wind and other renewable resources will contribute to meeting the estimated overall renewable electrical energy generation in 2025. For the purposes of this RFD, it is estimated that solar will comprise 90 percent of the state renewable energy portfolio. Reducing the 31,824 GWh to 90 percent of its value leaves 28,642 GWh of electricity generation to be met by solar sources.

Of the 28,642 GWh estimated to be generated by solar energy, some of this demand would be met through rooftop solar installations. The Western Governors' Association 2006 Solar Task Force Report identifies Arizona's 2005 rooftop solar capacity to be 5.7 gigawatts (GW) for residential, 3.8 GW for commercial (an average of 3.3 GW for tilted panels and 4.4 GW for flat panels), for a state total of 9.5 GW. Full development of this capacity would result in approximately 26,000 GWh per year of production[2], representing nearly 90 percent of 2025 estimated solar output; however, it is not expected that all rooftops will be covered with solar panels by 2025 and, for the purpose of this RFD, a more conservative estimate of 10 percent is used for the portion of solar energy output that will be met by rooftop solar. After the removal of this 10 percent, or 2,864 GWh, due to rooftop solar, 25,778 GWh remain to be satisfied by utility scale solar projects.

Divided by the number of hours in a year (8,766), 25,778 GWh translates into an installed capacity of 2.94 GW for a technology with a theoretical capacity factor of 100 percent. Depending on the technology

[2] GWh per year of production = 9.5 GW x 7.5 hours/day (average hours of available sunlight/day) x 365 days.

used, solar capacity factors–the amount of time in a 24 hour period that the technology produces electricity at its rated capacity–range from 23 percent for utility-scale PV applications to 38 percent for utility-scale parabolic trough applications (Frisvold et. al. 2009). For the purposes of this RFD, the mid-point of 31 percent was used. Dividing 2.94 GW by 31 percent (0.31) reveals that 9.48 GW of installed utility scale solar projects would be required to produce 25,778 GWh to help meet the 28,642 GWh of total electricity generation by solar resources in 2025.

To determine the amount of land necessary to meet this production capacity, the final figure of 9.48 GW was then multiplied by 8,000, an estimate of how many acres are required to create one GW of solar energy capacity.[3] This calculation resulted in a statewide project installation area of 75,840 acres. Of the potentially developable lands with solar capability, 15.5 percent of them are managed by the BLM. While different readers may make different assumptions regarding the proportion of projects that would occur on BLM-managed lands versus other lands, this RFD assumes that projects would be evenly distributed across available lands, with 15.5 percent of such projects (11,755 acres) occurring on BLM lands .

For the land disturbance associated with the development scenario, 100 percent of the lands associated with solar projects are assumed to be disturbed since this is often the reality of on-the-ground projects. Therefore, 75,840 acres (11,755 acres of BLM land) would be disturbed by developing solar projects to meet production capacity.

Wind RFD

The majority of the acreage identified as having wind potential occurs in the lowest commercially viable wind class, Class 3. The acreage breakdown for all of Arizona is as follows:

- Class 3 (Fair) – 885,941 acres
- Class 4 (Good) – 44,852 acres
- Class 5 (Excellent) – 10,801 acres
- Class 6 (Outstanding) – 3,591 acres
- Class 7 (Superb) – 396 acres

The acreage breakdown for BLM-managed lands by wind class is as follows:

[3] An "acres per megawatt" factor of 8 was calculated from dividing the total acres of disturbance by the sum nameplate capacity for 20 solar energy facilities across the Western US. Seventeen of the 20 projects were CSP, and the remaining three were PV.

- Class 3 (Fair) – 68,308 acres
- Class 4 (Good) – 3,746 acres
- Class 5 (Excellent) – 277 acres
- Class 6 (Outstanding) – 69 acres
- Class 7 (Superb) – 0 acres

Given the low acreage of high quality windy lands, it is estimated that wind would not contribute more than five percent to the state's renewable energy production. Reducing the anticipated statewide 2025 output of 31,824 GWh to five percent results in 1,591 GWh of electricity generation to be met by wind sources. For the purposes of this RFD, it is assumed that 10 percent of this capacity will be met through small scale wind projects, leaving 1,432 GWh to be satisfied by utility scale wind projects.

Divided by the number of hours in a year (8,766), 1,432 GWh translates into an installed nameplate capacity of 163 MW for a technology with a theoretical capacity factor of 100 percent. Wind capacity factors (i.e. the amount of time in a 24 hour period that the technology produces electricity at its rated capacity) typically range from 20 to 40 percent. For the purposes of this RFD and given the general lack of high quality wind resources, the capacity factor of 20 percent was used. Dividing 163 MW by 20 percent (0.20) reveals that 815 MW of installed, nameplate, utility scale wind projects would be required to produce 1,432 GWh to help meet the 1,591 GWh of total electricity generation by wind resources in 2025.

This final figure of 815 MW was then multiplied by 28, an estimate of how many acres are required to create one MW of wind energy capacity. The number of acres required per MW of generation capacity was determined assuming the use of 295 feet diameter, 3.0 MW capacity turbines spaced apart by 2,215 feet (7.5 times the turbine diameter[4]). A theoretical grid layout of 12 turbines with a total capacity of 36 MW would require a site that is 1,013 acres, resulting in a final factor of 28 acres per MW[5]. Therefore, projects with a total installed capacity of 815 MW are expected to occur over a project area of 22,820 acres across the state. Since BLM manages approximately 15.5 percent of the lands in Arizona, and it is assumed that projects would be similarly distributed across land ownership, it is estimated that 3,537 acres of BLM lands would be developed for wind projects.

[4] Turbine space of 7.5 times turbine diameter was the mid-point in the NREL-provided range of "5 to 10" turbine diameters that are required (NREL 2010b).

[5] A grid of twelve turbines arranged 3 by 3 with 675 meters between each turbine would have sides of 2,025 meters (i.e. 675 m multiplied by 3). The area of this grid would be 4,100,625 m^2, or 1,013 acres.

For the land disturbance associated with the development scenario, 10 percent[6] of the acres per MW of capacity are assumed to be disturbed. With wind projects, there is little ground disturbance outside of the actual turbine foundations, access roads, and ancillary facilities; lands between the turbines often remain undisturbed. This translates into an estimated area of disturbance of 2,282 acres statewide, and 354 acres across BLM lands from developing wind projects to meet production capacity.

RESULTS

Tables 1 and 2, included in the sections for solar and wind summarize key numerical results from the analyses of acreages and electrical generation capacity.

Solar

It is estimated that there are 38,315,000 acres of high potential solar lands across Arizona with slopes of less than five percent, regardless of land ownership, or technical or regulatory restrictions (refer to **Figure 1**). This estimate represents 53 percent of all lands in the State. When considering BLM-managed lands, 5,847,000 acres of high potential solar lands with slopes less than five percent were estimated; representing 48 percent of all BLM-managed lands in Arizona (refer to **Figure 2**).

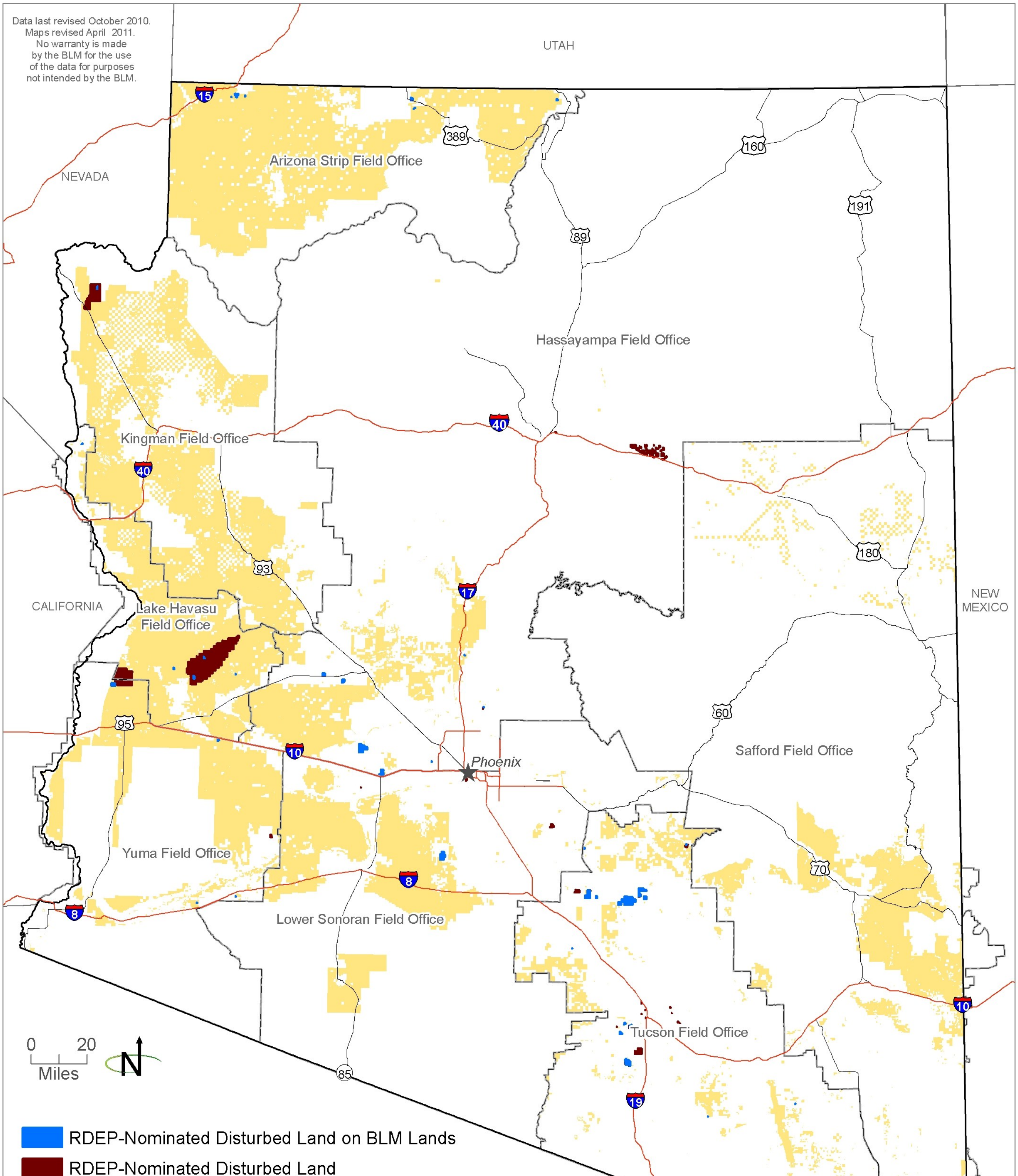
Lands without known technical or regulatory restrictions comprised 30,116,000 acres for the State as a whole (refer to **Figure 5**). If fully developed, these lands could provide 3,765 GW of electrical capacity through a combination of PV and parabolic trough technologies. When considering only BLM-managed lands, 4,680,000 acres were identified as having no known technical or regulatory restrictions (refer to **Figure 6**). If fully developed, these BLM-managed lands could provide 585 GW of capacity. These numbers represent 41 percent of all state lands, and 38 percent of all BLM-managed lands in Arizona, respectively.

The RFD, as based on a doubling of the Arizona RPS (15 percent renewable energy by 2025), estimates that 76,000 acres of lands across Arizona will be developed for 9.5 GW (nameplate capacity) of utility scale solar development, and that 12,000 of those acres (and 1.5 GW of that capacity) would be on BLM-managed lands.

Disturbed lands nominated during scoping for the RDEP EIS comprise 166,000 acres, 29,000 of which are located on BLM lands. These lands could produce an estimated 20.8 GW and 3.6 GW of solar energy, respectively. These RDEP-Nominated Disturbed Lands are shown in **Figure 9**.

[6] The Office of Utility Technologies estimates that land disturbance occurs at a rate of 5 to 10 percent for 50-MW turbines (Office of Utility Technologies et. al. 1997).

RDEP- Nominated Disturbed Lands



Source: BLM 2010b, BLM 2010c

Figure 9

Table 1
Solar Potential and RFD Results

Land Description (all lands have Direct Normal Irradiance ≥ 6.5 $kWh/m^2/day$)	Acres	Generation Capacity[7] (MW)
Statewide, Slope ≤ 5%	38,315,000	4,789,000
Slope ≤ 5% without Known Restrictions	30,116,000	3,765,000
BLM-managed, Slope ≤ 5%	5,847,000	731,000
BLM-managed, Slope ≤ 5% without Known Restrictions	4,680,000	585,000
RDEP Nominated	166,000	20,800
BLM-managed, RDEP Nominated	29,000	3,600
RFD (9.5 GW)	76,000	9,500
BLM-managed, RFD (9.5 GW)	12,000	1,500

Wind

It is estimated that there are 1,061,000 acres of high potential windy lands of slopes less than 15 percent across Arizona, regardless of land ownership, or technical or regulatory restrictions (refer to **Figure 3**). This estimate represents 1.5 percent of all lands in the State. When considering only BLM-managed lands, 96,000 acres of high potential windy lands with slopes less than 15 percent were estimated, representing 0.8 percent of all BLM-managed lands in Arizona (refer to **Figure 4**).

Lands without known technical or regulatory restrictions comprised 946,000 acres for the State as a whole (refer to **Figure 7**). If fully developed for wind energy, these lands could provide 33.8 GW of electrical capacity.

When considering only BLM-managed lands, 72,000 acres were identified as having no known technical or regulatory restrictions (refer to **Figure 8).** If fully developed, these BLM-managed lands could provide 2.6 GW of capacity. These numbers represent 1.3 percent of all state lands, and 0.6 percent of all BLM-managed lands in Arizona, respectively.

[7] Calculated by dividing lands in RFD acreage by a factor of 8 acres per megawatt. Results have been rounded.

Table 2
Wind Potential and RFD Results

Land Description (all lands of Wind Class ≥3)	Acres	Generation Capacity[8] (MW)
Statewide, Slope ≤ 15%	1,061,000	37,900
Slope ≤ 15% without Known Restrictions	946,000	33,800
BLM-managed, Slope ≤ 15%	96,000	3,400
BLM-managed, Slope ≤ 15% without Known Restrictions	72,000	2,600
RFD (820 MW)	23,000	820
BLM-managed, RFD (820 MW)	3,600	130

The RFD, as based on the Arizona RPS of 15 percent renewable energy by 2025, estimates that 23,000 acres of lands across Arizona will be developed for utility scale wind development, resulting in 820 MW of capacity, and that 3,600 of those acres and 130 of those MW would be on BLM-managed lands. Of the 3,600 acres of wind projects on BLM lands, approximately 360 of those acres are expected to be disturbed in the development process.

None of the RDEP nominated sites occurred within areas that were of Wind Class 3 or greater, so no estimate has been provided of the wind generating capacity of those sites.

CONCLUSIONS

The majority of BLM-managed land that is developable for solar energy projects occurs in the western half of Arizona with smaller areas identified to the east around Safford and smaller scattered parcels throughout the Tucson Field Office and in the northern portion of the Safford Field Office. Large tracts of land with no known technical or regulatory conflicts are identified along Highways 8 and 10 to the west of Phoenix, and in the north, south, and west of Highway 389.

Relatively few areas of BLM-managed lands are considered developable for wind energy projects across Arizona. These areas occur in several locations within the Arizona Strip Field Office in the northwestern corner of the state, west of Kingman near the California border, an area in the northern portion of the Tucson Field Office, and a scattering of

[8] Calculated by dividing lands in RFD acreage by a factor of 28 acres per megawatt. Results have been rounded.

areas in the northern portion of the Safford Field Office, south of Highway 40. No BLM-managed lands were found to contain the highest class of wind resources (Class 7) and only 69 acres were found to contain the second highest class resources (Class 6).

Arizona has a vast potential to produce renewable energy for both in-state use and out-of-state sale. This report identifies that, if all lands without known technical or regulatory restrictions are utilized to generate renewable power, approximately 3,800 GW of electrical capacity could be brought online.

When looking at disturbed sites nominated during the scoping process for the RDEP EIS, the 166,000 acres of disturbed lands statewide could produce an estimated 21 GW if they were developed with solar energy projects. The 29,000 acres of BLM-managed nominated lands could produce an estimated 3.6 GW if they were developed with solar energy projects. Because none of the nominated sites are classified as Class 3 or greater wind potential, it is estimated that no wind-generated electrical power would be produced on any of these sites.

Assuming that Arizona will meet its RPS of 15 percent renewable energy by 2025 two times over, allowing half of the renewable energy in the state to be exported to other states, and assuming that 15.5 percent of that generation occurs on BLM public lands (in proportion to the percentage of lands without known restrictions that BLM manages), the RFD estimates that 1.5 GW of solar energy capacity would be developed on 12,000 acres of BLM-managed lands and that 130 MW of wind energy would be produced on 3,600 acres of BLM public lands.

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APPENDIX B
DESIGN FEATURES AND BEST MANAGEMENT PRACTICES

This section provides an overview of RDEP Design Features and Best Management Practices associated with siting and design, construction, operation and maintenance, and decommissioning of renewable energy projects. Design features are requirements that must be met by the applicant and must be incorporated into project-specific Plans of Development (PODs), Plans of Operations, and ROW grants. In general, the design features are accepted practices that are known to be effective when implemented properly at the project level. However, their applicability and overall effectiveness cannot be fully assessed except at the project-specific level when the project location and design are known.

Table B-1, Design Features**,** has a suite of design features that would establish the minimum specifications for management of individual renewable energy projects and mitigate adverse impacts. These measures are organized by major resource topics and identify the phase(s) during which each measure would be implemented: S – siting and design; C – construction; O – operation and maintenance; and D – decommissioning and reclamation. Many of the potential design features indicate the need for project-specific plans or studies. The plans are included in **Table B-2**, Required Plans, and the studies are included in **Table B-3**, Required Studies. The content and applicability of these plans and studies will depend on specific project requirements and locations; however, some guidance is provided for what to include in specific plans. The authorizing officer would need to determine the adequacy of such plans or studies before approving a specific project.

Best management practices (BMPs) provided in **Table B-4**, Best Management Practices, are state-of-the-art mitigation measures applied on a site-specific basis to avoid, minimize, reduce, rectify, or compensate for adverse environmental or social impacts. They are selectively applied to projects too aid in achieving

desired outcomes for safe, environmentally responsible development, by preventing, minimizing, or mitigating adverse impacts and reducing conflicts. BMPs can also be proposed by project applicants for activities on public lands (e.g., for solar and wind development). BMPs not incorporated into the permit application by the applicant may be considered and evaluated through the environmental review process and incorporated into the use authorization as conditions of approval or rights of way stipulations.

Table B-1
Design Features

No.	Technology	Topic	Description of Measure	Phase
Air Quality				
1	Solar/Wind	Emissions	All heavy equipment shall meet emission standards specified in the state code of regulations, and routine preventive maintenance, including tune-up to the manufacturer's specification, shall be implemented to ensure efficient combustion and minimum emissions. Newer and cleaner equipment with more stringent emission controls shall be leased or purchased.	C, O, D
2	Solar/Wind	Emissions	All diesel engines used in the facility shall be fueled only with ultra-low sulfur diesel with 15-ppm sulfur content.	C, O, D
3	Solar/Wind	Emissions	Staging and queuing areas will not be located within 1,000 feet of sensitive receptors.	C, O, D
4	Solar/Wind	Fugitive dust	All soil disturbance activities and travel on unpaved roads shall be suspended during periods of high winds. A critical site-specific wind speed shall be established based on soil properties determined during site characterization, and wind speed monitoring would be required at the site during construction, operation, and reclamation.	C, O, D
Aviation				
5	Solar/Wind	Restricted airspace	In applications to appropriate lead agencies, provide a copy of a letter stating that the proposed project is compatible with the Airport Land Use Compatibility Plan. The following locations and design features may contribute to a decision that the facility is incompatible with operations of a nearby airport: • Siting the facility within 5,000 feet from a heliport or 20,000 feet (3.8 miles) of a runway that is at least 3,200 feet in actual length. • Locating portions of a facility within a designated airport safety zone, airport influence area, or airport referral area. • Introducing a thermal plume, visible plume, glare, or electrical interference into navigable airspace on or near an airport. • Proposing a structure that will exceed 200 feet in height above ground level.	S
6	Solar/Wind	Restricted airspace	Consult with the FAA regarding the heights of the project structures and avoid conflicts with aviation. Design the project to comply with FAA regulations, including lighting regulations, and to avoid potential safety issues associated with proximity to airports or landing strips.	S
7	Solar/Wind	Restricted airspace	Consult with representatives from the appropriate military installation for projects to be located under low-level military airspace. Design the project to address military concerns.	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
8	Solar/Wind	Restricted airspace	The Construction, Operation, and Maintenance Plan will display the location of project infrastructure (i.e. towers, access roads, substations) and will include mitigation measures to be implemented for site-specific and resource-specific environmental impacts.	S
Cultural Resources				
9	Solar/Wind	Cultural surveys	Project developers shall conduct a records search (Class I inventory) of published and unpublished literature for past cultural resource finds in the area of potential effects, including ancillary facilities such as access roads and utility lines; coordinate with researchers working locally in the area, and, depending on the extent of existing information, develop a survey design in coordination with the designated lead agency and SHPO, and complete a cultural resources inventory. The inventory shall be conducted according to the standards set forth in Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716), BLM Handbook H-8110: Guidelines for Identifying Cultural Resources (BLM 2002), and revised BLM Manual 8110 (BLM 2004). All inventory data shall be provided to the designated lead agency and the AZSITE database in digitized format that meets applicable accuracy standards, including shape files for surveyed areas.	S
10	Solar/Wind	Cultural surveys	A phased sampling strategy, beginning with a Class II inventory to assess various alternative development areas, is recommended prior to the selection of individual project locations. Class II inventory shall meet the standards set forth in the Secretary of Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716), BLM Handbook H-8110: Guidelines for Identifying Cultural Resources (BLM 2002), and revised BLM Manual 8110 (BLM 2004a).	S
11	Solar/Wind	Cultural surveys	Following field surveys ensure the survey report documents previously unrecorded and newly discovered resources information. Provide information necessary for evaluating each newly discovered resource's eligibility for the NRHP. Ensure the cultural resources specialist completes a technical report detailing the records search results, each survey's methods and results, including identified resources evaluations, and recommendations for resource evaluations based on the NRHP eligibility criteria. The reports should meet the lead agency's or agencies' published standards.	S
12	Solar/Wind	Cultural surveys	Retain the services of a geoarchaeologist, when appropriate, to investigate and complete a geomorphology technical report. Include the following elements: • Reconstruct the historical geomorphology of the project's Area of Potential Effects (APE); • Map and date the sediments of the landforms in that area;	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			• Assess whether buried archaeological deposits may be present and subject to project impacts.	
13	Solar/Wind	Cultural surveys	Retain a qualified cultural resources specialist to write and carry out a monitoring and mitigation plan or agreement, when applicable, and to be available if cultural resources are encountered during construction. Avoidance of known cultural resources is generally the preferred resolution option; include in the plan measures to protect avoided resources during construction and to prevent looting/vandalism and erosion. If project impacts to known NRHP-eligible cultural resources are unavoidable, data recovery may be approved as a mitigation measure; include a data recovery strategy in the plan. The project developer may also be asked by the appropriate lead agency to include additional measures for addressing the discovery of previously unknown cultural resources during construction. Consider the following measures, at a minimum: • Hire a qualified archaeological monitor to oversee project excavations and to monitor resources that will be protected from disturbance by construction-related activities. • Develop and use a cultural resources construction personnel training program to promote cultural resources identification and lawful and appropriate response to discoveries. • Notify involved agencies of unexpected cultural or historical resources discoveries during construction. The project developer may be asked or ordered to cease construction in the vicinity of the discovery to allow evaluation by an agency archaeologist and formulation of appropriate mitigation measures. • If human remains are discovered, cease construction and consult with the lead agencies. It is advisable to prepare a Plan of Action to address anticipated or unanticipated discoveries of materials protected under NAGPRA, even if such discoveries appear to be unlikely on the basis of the survey results. • Where project construction would directly and adversely affect NRHP eligible properties, scientific data recovery may be selected as an appropriate mitigation measure. Data recovery procedures shall be conducted in accordance with an agency-approved Data Recovery Plan including a detailed research design and methodology. • Have the cultural resources specialist prepare a report documenting archaeological monitoring and data recovery activities.	C, O, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
14	Solar/Wind	Treatment plans	Provide input to lead agency-prepared mitigation plans, agreement documents and related historic properties treatment plans. Treatment plans will guide: • Completion of a 100 percent archaeological surface survey (if not completed earlier in the permitting/pre-construction phase). • Outstanding geoarchaeological investigations. • Evaluation of newly identified cultural resources for NRHP eligibility. • Assessment of project impacts to NRHP-eligible cultural resources. • Implementation of site avoidance, monitoring, data recovery, reduction of visual impacts, or other measures developed to mitigate adverse impacts.	S
15	Solar/Wind	Monitoring	In cases where there is a probability of encountering cultural resources during construction that could not be fully detected during Class III inventory, cultural field monitors (appropriate for the resource anticipated) shall be employed to monitor ground disturbing activities. Development of a monitoring plan is recommended.	C, O, D
16	Solar/Wind	Education	The use of management practices, such as training/education programs for workers and the public, shall be implemented to reduce occurrences of human-related disturbances to nearby cultural sites. The specifics of these management practices shall be established in project-specific consultations between the applicant and the BLM as well as with the SHPO and Tribes, as appropriate.	S, C, O, D
17	Solar/Wind	Construction	The unexpected discovery of cultural resources during construction shall be brought to the attention of the responsible authorized officer immediately. Work shall be halted in the vicinity of the find. The area of the find shall be protected to ensure that resources are not removed, handled, altered, or damaged while they are being evaluated and appropriate mitigation measures are being developed.	C, O, D
Designated Areas with Wilderness Characteristics				
18	Solar/Wind	Viewsheds	Renewable energy facilities shall be located and designed to minimize impacts on the viewshed of specially designated visually sensitive areas, including areas managed by other federal, state, and local agencies.	S
19	Solar/Wind	Unique/ important areas	Locating renewable energy facilities in areas of unique or important cultural, recreation, wildlife, or visual resources shall be avoided, even if they do not possess a special area designation.	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
Ecological				
20	Solar/Wind	Surveys	All pre-disturbance surveys shall be conducted by qualified biologists following accepted protocols established by the USACE, BLM, USFWS, or other federal or state regulatory agencies, as determined appropriate by the designated lead agency, to identify and delineate the boundaries of important, sensitive, or unique habitats in the project vicinity including waters of the United States, wetlands, springs, seeps, ephemeral streams, intermittent streams, 100-year floodplains, ponds and other aquatic habitats, riparian habitat, remnant vegetation associations, rare or unique natural communities, and habitats supporting special status species populations. Applicants shall conduct surveys for Federal and/or State-protected species and other species of concern (including priority wildlife and special status plant and animal species) within the project area and design the project to avoid, minimize, or mitigate impacts to these resources.	S
21	Solar/Wind	Training	Develop a project-specific worker environmental awareness program (WEAP) that meets the approval of the permitting agencies and would be carried out during all phases of the project (site mobilization, ground disturbance, grading, construction, operation, closure/decommissioning, or project abandonment, and restoration/reclamation activities). Identify in the WEAP biological resources and BMPs for minimizing impacts to resources. Provide interpretation for non-English speaking workers, and provide the same instruction for new workers prior to their working onsite. Keep in project field construction office files the names of onsite personnel (for example, surveyors, construction engineers, employees, contractors, contractor's employees, subcontractors) who have participated in the education program. At a minimum, include the following in the program: • Photos and habitat descriptions for special status species that may occur on the project site and information on their distribution, general behavior, and ecology. • Species sensitivity to human activities. • Legal protections afforded the species. • Project BMPs for protecting species. • State and federal law violation penalties. • Worker responsibilities for trash disposal and safe/ humane treatment of wildlife and special status species found on the project site, associated reporting requirements, and specific required measures to prevent taking of threatened or endangered species. • Handout materials summarizing the contractual obligations and protective requirements specified in project permits and approvals. • Project site speed limit requirements and penalties.	C, O, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
22	Solar/Wind	Training	All personnel shall be instructed on the identification and protection of ecological resources (especially for special status species), including knowledge of mitigation measures required by federal, state, and local agencies. Workers must be aware that only qualified biologists are permitted to handle listed species according to specialized protocols approved by the USFWS. Workers shall not collect native plants and shall avoid contact with or any form of harassment of wildlife, including taking photographs or feeding. In addition, workers shall be prohibited from bringing firearms and pets to project sites. Observations of potential wildlife impacts, including wildlife mortality, shall be reported to the BLM authorized officer immediately.	C, O, D
23	Solar/Wind	Construction	If needed, temporary access roads shall be developed primarily through the removal of woody vegetation, although temporary timber mats should be used in areas of wet soils. Wide-tracked or balloon-tired equipment, timber corduroy, or timber mat work areas shall be used on wet soils, where wetland or stream crossings are unavoidable and when crossing on frozen ground is not possible in winter. Areas rutted by equipment shall be immediately regraded and revegetated. Tower installation shall be conducted by airlift helicopter, where necessary, to avoid extensive crossing of wetlands or highly sensitive areas (such as those identified as rare natural habitats).	C, O, D
24	Solar/Wind	Blasting	Explosives shall be used only within specified times and at specified distances from sensitive wildlife or surface waters, as established by the designated lead agency, or other federal and state agencies. The occurrence of flyrock from blasting shall be limited by using blasting mats.	C, D
25	Solar/Wind	Fugitive dust	Plants, wildlife, and their habitats shall be protected from fugitive dust through measures included in the facility's Dust Abatement Plan.	C, O, D
26	Solar/Wind	Traffic	Any vehicle-wildlife collisions or carrion shall be immediately reported to security or the on-site biological monitor. Observations of potential wildlife problems, including wildlife mortality, shall be immediately reported to the BLM or other appropriate agency authorized officer. Procedures for removal of wildlife carcasses on-site and along access roads shall be addressed in the Animal, Pest, and Vegetation Control Plan, to avoid vehicle-related mortality of carrion-eaters.	C, O, D
27	Solar/Wind	Traffic	New roads shall be designed and constructed to the appropriate BLM road design standards, such as those described in BLM Manual 9113 (BLM 1985), and be no larger than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Roads internal to solar facility sites shall be designed to minimize ground disturbance.	S
28	Solar/Wind	Lighting	Install and maintain shielded facility lighting to prevent upward and side casting of light towards wildlife habitat and propose use of motion sensors. Lighting shall be designed to provide the minimum illumination needed to achieve safety and security objectives. All unnecessary lighting shall be turned off at night to limit attracting migratory birds or special status species. Towers that require lighting for aviation safety shall comply with the USFWS communications tower	S, C, O, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			guidance. Unless otherwise required by the Federal Aviation Administration (FAA), only white (preferable) or red strobe lights shall be used at night, and these shall be the minimum number and minimum intensity allowable by the FAA. The strobes should be on for a brief a period as possible and the time between strobe or flashes should be the longest possible. Synchronize strobes so that a strobe effect is achieved and towers are not constantly illuminated. The use of solid red or pulsating red warning lights at night shall be avoided. Current research indicates that solid or pulsating (beacon) red lights attract night-migrating birds at a much higher rate than white strobe lights. Red strobe lights have not yet been studied.	
29	Solar/Wind	Lighting	Towers that require lighting for aviation safety shall comply with USFWS communications tower guidance. Unless otherwise required by the FAA, only white (preferable) or red strobe lights shall be used at night, and these shall be the minimum number, minimum intensity, and minimum number of flashes per minute (longest duration between flashes) allowable by the FAA. The use of solid red or pulsating red warning lights at night shall be avoided. Current research indicates that solid or pulsating (beacon) red lights attract night-migrating birds at a much higher rate than white strobe lights. Red strobe lights have not yet been studied.	S, C
30	Solar/Wind	Lighting	Keep lighting at operation and maintenance facilities and substations located within 0.5 mile of the turbines to the minimum required for meeting FAA guidelines, and safety and security needs.	S, C
31	Solar/Wind	Road construction	If the need for using surfacing, road sealant, soil bonding, and stabilizing agents on non-paved surfaces is determined use agents that have been shown to be non-toxic to wildlife and plants.	C, O, D
32	Solar/Wind	Cattle guards	If cattle guards are identified for the design for new roads, they shall be wildlife friendly. To the extent practicable, improvements shall be made to existing ways and trails that require cattle to pass through existing fences, fence-line gates, new gates, and standard wire gates alongside them.	S
33	Solar/Wind	Trenches	Because open trenches could impede the seasonal movements of large game animals and alter their distribution, they shall be backfilled as quickly as is possible. Open trenches could also entrap smaller animals; therefore, escape ramps shall be installed at regular intervals along open-trench segments at distances identified in the applicable land use plan or best available information and science. Additionally, an appropriate number of qualified biological monitors (as determined by the federal authorizing agency and the USFWS) shall be on-site to monitor, capture, and relocate animals that become entrapped in trenches and are unable to escape on their own.	C, O, D
34	Solar/Wind	Fences	Fences shall be built (as practicable) to exclude livestock and wildlife from all project facilities, including all water sites.	C, O

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
35	Solar/Wind	Evaporation ponds	If the use of open evaporation ponds is permitted for the project. Ponds will be designed with deterrents for wildlife usage, especially waterfowl.	S
36	Solar/Wind	Aquatic habitat	Projects shall avoid surface water or groundwater withdrawals that affect sensitive habitats (e.g., aquatic, wetland, and riparian habitats) and any habitats occupied by special status species. Applicants shall demonstrate, through hydrologic modeling, that the withdrawals required for their project are not going to affect groundwater discharges that support special status species or their habitats.	S
37	Solar/Wind	Aquatic habitat	If transmission lines are located near aquatic habitats or riparian areas (e.g. minimum buffers identified in applicable land use plan or best available science and information), vegetation maintenance shall be limited and performed mechanically rather than with herbicides. Cutting in wetlands or stream and wetland buffers shall be conducted by hand or feller-bunchers. Tree cutting in stream buffers shall only target trees able to grow into a transmission line conductor clearance zone within 3 to 4 years. Cutting in such areas for construction or vegetation management shall be minimized, and the disturbance of soil and remaining vegetation shall be minimized.	S, C
38	Solar/Wind	Fish passage	Any necessary stream crossings shall be designed to provide in-stream conditions that allow for and maintain uninterrupted movement and safe passage of fish during all project periods.	S
39	Solar/Wind	Aquatic species	Appropriate fish screens shall be installed on cooling water intakes to limit the potential for impingement impacts on organisms in surface water sources used for cooling water. Intake designs shall minimize the potential for entrainment of aquatic organisms from surface waters into cooling water systems.	C
40	Solar/Wind	Habitat	Meteorological towers, soil borings, wells, and travel routes shall be located to avoid important, sensitive, or unique habitats including but not limited to wetlands, springs, seeps, ephemeral streams, intermittent streams, 100-year floodplains, ponds and other aquatic habitats, riparian habitat, remnant vegetation associations, rare natural communities, and habitats supporting special status species populations, as identified in applicable land use plans or best available information and science.	S, C
41	Solar/Wind	Habitat	Projects shall not be sited in designated critical habitat, ACECs, or other specially designated areas that are considered necessary for special status species and habitat conservation.	S
42	Solar/Wind	Habitat	A habitat restoration plan shall be developed to avoid, minimize, or mitigate negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. The plan shall identify reclamation, soil stabilization, and erosion reduction measures that shall be implemented to ensure that all temporary use areas are restored. The plan shall require that restoration occur	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			as soon as possible after completion of activities, provided such revegetation will not compromise the function of any buried utilities, to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats. Species salvaged during construction could be transplanted into these areas at a density similar to pre-construction conditions. Revegetation shall focus on the establishment of native plant communities similar to those present in the vicinity of the project site. Species used shall consist of native species dominant within the plant communities existing in adjacent areas having similar soil conditions. Certified weed-free seed mixes of native shrubs, grasses, and forbs of local origin shall be used. In areas where suitable native species are unavailable, other plant species approved by BLM could be used. The restoration plan shall include adaptive management and a monitoring plan. The monitoring plan will establish success thresholds.	
43	Solar/Wind	Wildlife	Meteorological towers and solar sensors shall be located to avoid sensitive habitats or areas where wildlife are known to be sensitive to human activities (e.g., sage grouse; refer to applicable land use plan or best available information and science to determine avoidance distances). Installation of these components shall be scheduled to avoid disruption of wildlife reproductive activities, migratory behaviors, or other important behaviors. Guy wires on meteorological towers shall be avoided whenever possible. If guy wires are necessary, permanent markers (bird flight diverters) shall be attached to the guy wires to increase their visibility. The area disturbed by installation of meteorological towers (i.e., footprint) shall be kept to a minimum.	S, C
44	Solar/Wind	Wildlife timing	Activities shall be timed to avoid, minimize, or mitigate impacts on wildlife. For example, crucial winter ranges for elk, deer, pronghorn, and other species shall be avoided especially during their periods of use. If activities are planned during bird breeding seasons, a nesting bird survey shall be conducted first. If active nests were detected, the nest area shall be flagged, and no activity shall take place near the nest (at a distance determined in consultation with the USFWS) until nesting was completed (i.e., nestlings have fledged or the nest has failed) or until appropriate agencies agree that construction can proceed with the incorporation of agreed-upon monitoring measures. The timing of activities shall be coordinated with the state wildlife agencies.	S, C, O, D
45	Solar/Wind	Birds/bats	Operators shall evaluate avian and bat use of the project area and design the project to minimize or mitigate the potential for bird and bat strikes (e.g., development shall not occur in riparian habitats and wetlands). Avian and bat use surveys consistent with current methodologies and standards shall be conducted; the amount and extent of ecological baseline data required shall be determined on a project basis. Develop a bat and avian protection plan to protect bats and migratory birds, while improving conservation, safety, and reliability for utility customers.	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
46	Wind	Birds/bats	Locate turbines to avoid separating birds and bats from their seasonal migration corridors, daily roosting, feeding, or nesting sites if documented that the turbines' presence poses a risk to species.	S
47	Solar/Wind	Raptors	Removal of raptor nests shall take place only if the birds are not actively using the nest, particularly during the nesting and brood-rearing period. Nests shall be relocated to nesting platforms, when possible; otherwise, they must be destroyed when removed. An annual report on all nests moved or destroyed will be provided to the appropriate federal and/or state agencies. Coordination with the USFWS will occur in the event that a raptor nest is located on a transmission line support structure.	C, O, D
48	Solar/Wind	Ravens	Raven nests shall be removed from transmission towers to reduce predation pressure on sensitive species such as the desert tortoise.	C, O, D
49	Solar/Wind	Birds/ raptors	Any power line–associated mortality of bird species (e.g., raptors) shall be monitored and reported to the BLM and the USFWS, and measures shall be taken to prevent future mortality.	C, O, D
50	Solar/Wind	Birds	If a proposed project has the potential to impact golden eagles or their habitat, an Avian Protection Plan (APP) would be required as a condition of the BLM right-of-way grant. The APP would be developed by the applicant, in coordination with the FWS and the BLM, to evaluate options to avoid and minimize the project impacts. The APP must address siting, operations, and monitoring, and if necessary, would incorporate eagle conservation measures to reduce project impacts.	S
51	Solar/Wind	Birds	Facilities shall be designed to discourage their use as perching or nesting substrates by birds. For example, power lines and poles shall be configured to minimize raptor electrocutions and discourage raptor and raven nesting and perching. Transmission lines and electrical components shall be installed and maintained in accordance with the APLIC Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (Avian Power Line Interaction Committee 2006) to reduce the likelihood of electrocutions of raptors and other large birds.	S
52	Solar/Wind	Birds	Use flashing or strobe lights on turbines, meteorological towers, and/or heliostat towers to minimize avian collision risk.	S, C, O
53	Solar/Wind	Birds	Guy wires on permanent meteorological towers shall be avoided, however, may be necessary on temporary meteorological towers installed during site monitoring and testing. If guy wires are necessary, the meteorological towers shall be periodically inspected to determine whether permanent markers (bird flight diverters) attached to the guy wires are necessary to increase visibility.	S, C

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
54	Wind	Bats	Operators shall determine the presence of bat colonies and avoid placing turbines near known bat hibernation, breeding, and maternity/nursery colonies; in known migration corridors; or in known flight paths between colonies and feeding areas.	S
55	Solar/Wind	Eagles	At the project level, recommendations contained in the Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocol; and Other Recommendations in Support of Golden Eagle Management and Permit Issuance (Pagel et al. 2010) shall be considered in project planning, as appropriate. Additionally, the Bald and Golden Eagle Protection Act–Golden Eagle National Environmental Policy Act and Avian Protection Plan Guidance for Renewable Energy (Instruction Memorandum No. 2010-156) will need to be adhered to (BLM 2010b) until programmatic permits from the USFWS are available. This memorandum requires that consideration of golden eagles and their habitat be incorporated into site-specific NEPA analysis for all renewable energy projects and determine whether the project has the potential to affect golden eagles or their habitat. It must be determined whether breeding territories/nests, feeding areas, roosts, or other important golden eagle use areas are located within the analysis area. The analysis shall be made in coordination with the USFWS and AZGFD. If the proposed project has the potential to affect golden eagles or their habitat, an analysis shall be completed that includes: (1) direct and indirect effects analysis; (2) cumulative effects analysis; (3) BMPs; (3) avian protection plans; (4) interagency coordination; and (5) record of decision, decision record, and notice to proceed.	S
56	Solar/Wind	Eagles	Avoid, to the extent needed to comply with state and federal requirements, siting project facilities and infrastructure in a location or manner that would cause bald and golden eagle mortality, injury, and/or disturbance; i.e. locate facilities outside of eagle breeding home ranges as well as important breeding, wintering, and dispersal foraging areas, migration stopovers and corridors, and areas used by eagles for thermal or orographic lift.	S
57	Solar/Wind	Eagles	Where applicable, incorporate actions to avoid eagle disturbance (refer to the FWS National Bald Eagle Management Guidelines (U.S. Fish and Wildlife Service 2007).	S
58	Solar/Wind	Raptors	Operators shall determine the presence of active raptor nests (i.e., raptor nests used during the breeding season) and design the project to provide for spatial buffers and timing restrictions for surface disturbing activities. Operators shall coordinate with AZGFD to help determine the appropriate survey methods. Measures to reduce raptor and/or raptor prey species use at a project site (e.g., minimize road cuts, maintain either no vegetation or plant species that are unattractive to raptors around the turbines) shall also be identified.	S
59	Solar	Special status species	The capability of local surface water or groundwater supplies to provide adequate water for operation of proposed solar facilities shall be considered early during project siting and design.	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			Technologies that would result in large withdrawals that would affect water bodies that support ESA-listed species shall not be considered.	
60	Solar/Wind	Special status species	Pipelines that transport hazardous liquids (e.g., oils) that will pass through aquatic or other habitats containing sensitive species shall be designed with block or check valves on both sides of the waterway or habitat to minimize the amount of product that could be released due to leaks. Such pipelines shall be constructed of double-walled pipe at river crossings.	S
61	Solar/Wind	Desert tortoise	Ensure the biologist inspects construction pipes, culverts, or similar structures: (a) with a diameter greater than 3 inches, (b) stored for one or more nights, (c) less than 8 inches aboveground, and (d) within desert tortoise habitat (such as outside the permanently fenced area), before the materials are moved, buried, or capped. As an alternative, cap such materials before storing outside the fenced area or placing on pipe racks. Avoid inspection or capping if the materials are stored within the permanently fenced area after completing desert tortoise clearance surveys.	C, D
62	Solar/Wind	Special status species	If it is determined through coordination with the appropriate federal and state agencies (e.g., BLM, USFWS, and state resource management agencies) that it is necessary to translocate plant and wildlife species from project areas, developers shall ensure that qualified biologists conduct pre- and post-translocation surveys for target species (especially if the target species are special status species) and release individuals to protected off-site locations as approved by the federal and state agencies. The biologists shall coordinate with appropriate agencies the safe handling and transport of encountered special status species.	S, C, O, D
63	Solar/Wind	Special status species	If any federally listed threatened and endangered species are found, the USFWS shall be consulted as required by Section 7 of the ESA, and an appropriate course of action shall be determined to avoid or mitigate impacts. After found, the species will be avoided and the BLM approving officer shall be contacted immediately. If a biological monitor is present on site, they shall record the sighting, follow approved protection measures, and make the appropriate contacts.	C, O, D
64	Solar/Wind	Vegetation	A Water Resources Monitoring and Mitigation Plan shall be developed for each project. Changes in surface water or groundwater quality (e.g., chemical contamination, increased salinity, increased temperature, decreased dissolved oxygen, and increased sediment loads) or flow that result in alteration of terrestrial plant communities or communities in wetlands, springs, seeps, intermittent streams, perennial streams, and riparian areas (including alterations of cover and community structure, species composition, and diversity) off the project site shall be avoided to the extent practicable. A monitoring plan shall be developed that determines the effects of groundwater withdrawals on plant communities. See measures applicable to protecting water quality.	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
65	Solar/Wind	Cactus	As directed by the local BLM field office, Joshua trees (*Yucca brevifolia*), other Yucca species, and most agave and cactus species, shall be salvaged prior to land clearing, and transplanted, held for use in revegetating temporarily disturbed areas, or otherwise protected as prescribed by state or local BLM requirements.	C, O, D
66	Solar/Wind	Noxious weeds	An Integrated Vegetation Management Plan shall be developed that is consistent with applicable regulations and agency policies for the control of noxious weeds and invasive plant species. The plan shall address monitoring; ROW vegetation management; the use of certified weed-free seed and mulching; the cleaning of vehicles to avoid the introduction of invasive weeds; and the education of personnel on weed identification, the manner in which weeds spread, and the methods for treating infestations. The plan shall investigate possibilities of revegetating parts of the renewable energy project area. Where revegetation is accomplished, fire breaks shall be required such that vegetated areas would not result in increased fire hazard. For transmission line ROWs, the plan shall be consistent with the existing vegetation management plan for that ROW. Principles of integrated pest management, including biological controls, shall be used to prevent the spread of invasive species. The plan shall include periodic monitoring, reporting, and immediate eradication of noxious weed or invasive species occurring within all managed areas. A controlled inspection and cleaning area shall be established to visually inspect construction equipment arriving at the project area and to remove and collect seeds that may be adhering to tires and other equipment surfaces. To prevent the spread of invasive species, project developers shall work with the local BLM field office to determine whether a pre-activity survey is warranted, and if so, conduct the survey. If invasive plant species are present, project developers shall work with the local BLM field office to develop a control strategy. The plan shall include a post-construction monitoring element that incorporates adaptive management protocols.	S
67	Solar/Wind	Hazardous materials	Design features for hazardous materials and waste management regarding refueling, equipment maintenance, and spill prevention and response shall be applied to reduce the potential for impacts on ecological resources.	C, O, D
68	Solar/Wind	Hazardous materials	A Spill Prevention and Emergency Response Plan shall be developed that considers sensitive ecological resources. Spills of any toxic substances shall be promptly addressed and cleaned up before they can enter aquatic or other sensitive habitats due to runoff or leaching.	S
69	Solar/Wind	Pesticide use	If pesticides are used on the site, an integrated pest management plan shall be developed to ensure that applications will be conducted within the framework of BLM and DOI policies and entail only the use of EPA-registered pesticides. Pesticide use shall be limited to nonpersistent, immobile pesticides and shall only be applied in accordance with label and application permit directions and stipulations for terrestrial and aquatic applications. Any applications of herbicides	S, C, O, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			will be subject to BLM herbicide treatment standard operating procedures. Only herbicides on the list of approved herbicide formulations (updated annually) will be used on public lands.	
70	Solar/Wind	Pests	Prepare a facility vector (such as mosquitoes or rodents) control plan, as appropriate, that meets the permitting agency approval and would be implemented during all phases of the project.	S
71	Solar/Wind	Fire	A Fire Management and Protection Plan shall be developed to implement measures to minimize the potential for a human-caused fire to affect ecological resources and respond to natural fire situations.	S
72	Solar/Wind	Waste	A Trash Abatement Plan shall be developed that focuses on containing trash and food in self-closing, sealable containers with lids that latch and empty them daily to reduce their attractiveness to opportunistic species, such as common ravens, coyotes, and feral dogs that could serve as predators on native wildlife and special status animals. Remove trash containers associated with construction from the project site when construction is complete.	S
73	Solar/Wind	Reclamation	A Decommissioning and Site Reclamation Plan specific to the project shall be developed and implemented. Baseline data shall be collected in each project area as a benchmark for measuring the success of reclamation efforts. The plan shall contain an adaptive management component that allows for the incorporation of lessons learned from monitoring data. The plan shall require that land surfaces be returned to pre-development contours to the greatest extent feasible immediately following decommissioning. The plan shall focus on the establishment of native plant communities similar to those present in the vicinity of the project site. The plan shall be designed to expedite the re-establishment of vegetation and require restoration to be completed as soon as practicable. To ensure rapid and successful re-establishment efforts, the plan shall specify site-specific measurable success criteria, including target dates, which shall be developed in coordination with the BLM and which shall be required to be met by the operator. Vegetation re-establishment efforts shall continue until all success criteria have been met. Bonding to cover the full cost of vegetation re-establishment shall be required. Species used for vegetation re-establishment shall consist of native species dominant within the plant communities existing in adjacent areas having similar soil conditions. The plan shall require the use of weed-free seed mixes of native shrubs, grasses, and forbs of local sources where available. When available, seed of known origin as labeled by state seed certification programs shall be used. Local native genotypes shall be used. If cultivars of native species are used, certified seed (i.e., blue tag) shall be used. "Source identified" seed (i.e., yellow tag) shall be used when native seed is collected from wildland sites. The cover, species composition, and diversity of the re-established plant community shall be similar to those in the vicinity of the site. In areas where suitable native species are unavailable, other plant species approved by the BLM could be used. If non-natives	S, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			are necessary they shall be non-invasive, non-competitive, and ideally are short-lived, have low reproductive capabilities, or be self-pollinating to prevent gene flow into the native community. Non-natives used shall not exchange genetic material with common native plant species. The plan shall also include site-specific, measurable success criteria that must be met. The plan shall be developed in coordination with appropriate federal and state agencies.	
74	Solar/Wind	Reclamation	Post-decommissioning protocols shall include monitoring for native vegetation recovery; invasive species colonization and spread; wildlife use; and special status species use. Monitoring data shall be used to determine the success of reclamation activities and the need for changes in ongoing management or for additional reclamation measures. Ongoing visual inspections for a minimum of 5 years following decommissioning activities shall be required to ensure adequate restoration and minimal environmental degradation. This period shall be extended until satisfactory results are obtained.	D
75	Solar/Wind	Mitigation/ monitoring	Prepare a project specific mitigation and monitoring plan in cooperation with and that meets the approval of permitting agencies and AZGFD where applicable. Carry out the plan during all phases of the project to avoid, minimize, or mitigate adverse direct, indirect, and cumulative impacts, including habitat, special status plant, and wildlife species losses. Address at a minimum: • Biological resource mitigation, monitoring, and compliance measures required by federal, state, and local applicable permitting agencies. • Documentation (based on surveys) of sensitive plant and wildlife expected to be affected by all phases of the project (project construction, operation, abandonment, and decommissioning). Agencies may request additional surveying, based on the documentation or past experience working with the resources. Include measures to avoid or minimize impacts to species and habitat. • A detailed description of measures, including revegetation, soil stabilization, and erosion reduction measures, to minimize or mitigate permanent and temporary disturbances on vegetation, wildlife, and special status plants and animals from construction activities. The plan shall require that restoration occur as soon as possible after completion of activities to reduce the amount of habitat converted at any one time and to hasten the recovery to natural habitats.	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			• Mitigation and monitoring unavoidable impacts on waters of the US, including wetlands. • Demonstration of compliance of the project with the regulatory requirements of the Bald and Golden Eagle Protection Act. The plan shall be developed in coordination with the USFWS. • Measures to protect birds (including migratory species protected under the Migratory Bird Treaty Act) developed in coordination with the appropriate federal and state agencies (e.g. BLM, USFWS, and state resource management agencies). • Measures to mitigate and monitor impacts on special status species developed in coordination with the appropriate federal and state agencies (e.g. BLM, USFWS, and state resource management agencies). • Monitoring the potential for increase in predation of special status species (especially desert tortoise) from ravens and other species that are attracted to developed areas and opportunistically use tall structures to spot vulnerable prey. • Clearing and translocation of special status species, including the steps to implement the translocation as well as the follow-up monitoring of populations in the receptor locations, as determined in coordination with the appropriate federal and state agencies. The need for a Special Status Species Clearance and Translocation Plan shall be determined on a project-specific basis. • All locations on a map, at an approved scale, of sensitive plant and wildlife areas subject to disturbance and areas requiring temporary protection and avoidance during construction. • Aerial photographs or images, at an approved scale, of areas to be disturbed during project construction activities. • Duration for each type of monitoring and a description of monitoring methodologies and frequency. • Performance standards, thresholds, monitoring, and criteria to be used to	

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			determine if/when proposed mitigation is or is not successful. • All standards and remedial measures to be implemented if performance standards and criteria are not met. • Adaptive management strategies. • A closure/decommissioning or abandonment plan, including a description of funding mechanism(s).	
76	Solar/Wind	Monitoring	Designate a qualified biologist (approved by the BLM) responsible for overseeing compliance with biological resources BMPs and project-specific mitigation measures during mobilization, ground disturbance, grading, construction, operation, and closure/decommissioning, or project abandonment, particularly in areas containing or known to have contained sensitive biological resources, such as special status species and unique plant assemblages. Additional qualified biological monitors may be required on-site during all project phases as determined by the authorizing federal agency. It is suggested that the qualified biologist be responsible for actions including, but not limited to, the following: • Clearly marking sensitive biological resource areas and inspecting the areas at appropriate intervals for meeting regulatory terms and conditions. • Inspecting, daily, active construction areas where wildlife may have become trapped (for example, trenches, bores, and other excavation sites that constitute wildlife pitfalls outside the permanently fenced area) before beginning construction. At the end of the day, conducting wildlife inspections of installed structures that would entrap or not allow escape during periods of construction inactivity. Periodically inspecting areas with high vehicle activity (such as parking lots) for wildlife in harm's way. • Overseeing cactus, agave, and yucca salvage operations. • Immediately recording and reporting hazardous spills immediately as directed in the project hazardous materials management plan. • Coordinating directly and regularly with permitting agency representatives regarding biological resources issues, including biological resource BMP implementation. f) Maintaining written records regarding implementation of biological resource BMPs and providing a summary of these records periodically in a report to the appropriate agencies. g) Notifying the project owner and appropriate agencies of non-compliance with biological resources BMPs.	C, O, D
Geologic Hazards				

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
77	Solar/Wind	Geotechnical specifications	Build project structures in accordance with the design basis recommendations specified in the project specific geotechnical investigation report.	S, C
Hazardous Materials				
78	Solar/Wind	Phase I surveys	For projects proposed on previously disturbed or developed lands, conduct a Phase I site assessment (ASTM E1527 or other equivalent assessment method deemed acceptable by the appropriate regulatory oversight agency) for the project site and linear appurtenances. If Phase I identifies environmental conditions, concerns, or data gaps requiring additional site assessment to adequately characterize the site, conduct additional site assessment work (such as Phase 2) with appropriate regulatory agency oversight. Provide the Phase I, and if conducted, the Phase 2 site assessment with applications to appropriate lead agencies.	S
79	Solar/Wind	Hazardous materials/ waste plan	A Hazardous Materials and Waste Management Plan shall address the selection, transport, storage, and use of all hazardous materials needed for construction, operation, and decommissioning of the facility for local emergency response and public safety authorities and for the regulating agency, and shall address the characterization, on-site storage, recycling, and disposal of all resulting wastes. The plan shall, at a minimum, include the following: facility identification; comprehensive hazardous materials inventory; Material Safety Data Sheets (MSDS) for each type of hazardous material; emergency contacts and mutual aid agreements, if any; site map showing all hazardous materials and waste storage and use locations; copies of spill and emergency response plans (see below), and hazardous materials-related elements of a decommissioning/closure plan.	S, C, O, D
80	Solar/Wind	Hazardous materials/ waste plan	A Construction and Operation Waste Management Plan shall identify the waste streams that are expected to be generated at the site and addresses hazardous waste determination procedures, waste storage locations, waste-specific management and disposal requirements, inspection procedures, and waste minimization procedures. The plan shall address all solid and liquid wastes that may be generated at the site in compliance with the CWA requirements to obtain the project's NPDES permit.	S, C, O, D
81	Solar/Wind	Hazardous materials	All hazardous materials and vehicle/equipment fuels shall be transported, stored, managed, and disposed in accordance with accepted BMPs and in compliance with all applicable regulations and the requirements of approved plans, including, where applicable, a Stormwater Management Plan, a Spill Prevention and Emergency Response Plan, and a Hazardous Materials and Waste Management Plan.	C, O, D
82	Solar/Wind	Hazardous materials	Systems containing hazardous materials shall be designed and operated in a manner that limits the potential for hazardous materials release, constructed of compatible materials, and in good condition (as verified by periodic inspections), including provision of secondary containment	S, C, O, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			features (to the extent practical); installation of sensors or other devices to monitor system integrity; installation of strategically placed valves to isolate damaged portions and limit the amount of hazardous materials in jeopardy of release; and robust inspection and repair procedures.	
83	Solar/Wind	Hazardous materials	All site characterization, construction, operation, and decommissioning activities shall be conducted in compliance with applicable federal and state laws and regulations, including the Toxic Substances Control Act of 1976, as amended (15 USC 2601, et seq.). In addition, any release of toxic substances (leaks, spills, and the like) in excess of the reportable quantity established by 40 CFR Part 117 shall be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, Section 102b. A copy of any report required or requested by any federal agency or state government as a result of a reportable release or spill of any toxic substances shall be furnished to the authorized officer concurrent with the filing of the reports to the involved federal agency or state government. In addition, the United States shall be indemnified against any liability arising from the release of any hazardous substance or hazardous waste on the facility or associated with facility activities.	S, C, O, D
84	Solar/Wind	Hazardous materials storage	Secondary containment shall be provided for all onsite hazardous materials and waste storage, including fuel. In particular, fuel storage (for construction vehicles and equipment) shall be a temporary activity occurring only for as long as is needed to support construction activities.	C, O, D
85	Solar/Wind	Herbicide/ pesticide use	When an herbicide/pesticide is used to control vegetation, the climate, soil type, slope, and vegetation type shall be considered in determining the risk of herbicide/pesticide contamination (BLM 2006a). Additionally, an Animal, Pest, and Vegetation Control Plan shall be developed to ensure that applications are conducted within the framework of BLM and U.S. Department of the Interior (DOI) policies and standard operating procedures and entail only the use of EPA-registered pesticides/herbicides that also comply with state and local regulations.	C, O, D
86	Solar/Wind	Herbicide/ pesticide use	Use appropriate herbicide-free/pesticide-free buffer zones for herbicides not labeled for aquatic use, based on permitting agency or BLM/U.S. Forest Service risk assessment guidance. The federal guidance suggests minimum widths of 100 feet for aerial applications, 25 feet for applications dispersed by vehicle and 10 feet for hand spray applications.	C, O, D
87	Solar/Wind	Fire	A Fire Management and Protection Plan shall be developed to implement measures to minimize the potential for fires associated with substances used and stored at the site. The flammability of the specific HTF used at the facility shall be considered.	S, C, O, D
88	Solar/Wind	Spills	A comprehensive Spill Prevention and Emergency Response Plan shall be developed for the facility that meets the following criteria: is written, periodically updated, and made available to the entire workforce; contains procedures for timely notification of appropriate authorities,	S, C, O, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			including the designated BLM land manager; provides spill/emergency contingency planning for each type of hazardous material present, including abatement or stabilizing of release, recovery of spilled product, and remediation of impacted environmental media; is supported by the strategic deployment of appropriate spill response materials and equipment, including PPE for individuals with spill or emergency response assignments; provides for prompt response to spills and timely delivery of recovered spill materials and contaminated environmental media to appropriately permitted off-site treatment or disposal facilities; formally assigns spill and emergency response duties to specified individuals; provides and documents appropriate training to individuals with spill or emergency response assignments; provides for the prompt response to spills and timely delivery of recovered spill materials and contaminated environmental media to appropriately permitted off-site treatment or disposal facilities; provides general awareness training to remaining facility personnel; and provides for written documentation of each event, including root cause analysis, corrective actions taken, and a characterization of the resulting environmental or health and safety impacts.	
89	Solar/Wind	Ordnances	Project developers shall survey project sites for unexploded ordnance, especially if projects are within 20 mi (32 km) of a current U.S. Department of Defense (DOD) installation or formally used defense site.	S, C
90	Solar/Wind	Accidents	In the event of an accidental release of hazardous materials to the environment, the operator shall document the event, including a root cause analysis, appropriate corrective actions taken, and a characterization of the resulting environmental or health and safety impacts. Documentation of the event shall be provided to the BLM authorized officer and other Federal and State agencies, as required.	C, O, D
91	Solar/Wind	Contaminated soils	If any newly found potentially contaminated soils are discovered, contractors would stop work immediately in that area and notify the project proponent, BLM, and Arizona Department Environmental Quality of the discovery and coordinate for any excavation and disposal of the soil.	C, O, D
Health and Safety				
92	Solar/Wind	Health and safety	A health and safety program shall be developed to protect workers during site characterization, construction, operation, and decommissioning of a renewable energy project. The program shall identify all applicable federal and state occupational safety standards and establish safe work practices addressing all hazards, including requirements for developing the following plans: general injury prevention; PPE requirements and training; respiratory protection; hearing conservation; electrical safety; hazardous materials safety and communication; housekeeping and material handling; confined space entry; hand and portable power tool use; gas-filled equipment	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			use; and rescue response and emergency medical support, including on-site first-aid capability.	
93	Solar/Wind	Health	If operation of the solar and/or wind facility and associated transmission lines and substations is expected to cause potential adverse impacts on nearby residences and occupied buildings from noise, sun reflection, flicker, or EMF, recommendations for addressing these concerns shall be incorporated into the project design (e.g., establishing a sufficient setback from transmission lines).	O
94	Solar/Wind	Hazardous materials	In the event of an accidental release of hazardous substances to the environment, project developers shall document the event, including a root cause analysis, appropriate corrective actions taken, and a characterization of the resulting environmental or health and safety impacts. Documentation of the event shall be provided to the permitting agencies and other federal and state agencies within 30 days, as required.	C, O, D
95	Solar/Wind	Safety	In addition, the health and safety program shall address OSHA standard practices for the safe use of explosives and blasting agents (e.g., if used to construct foundations for power tower facilities); measures for reducing occupational EMF exposures; the establishment of fire safety evacuation procedures; and required safety performance standards (e.g., electrical system standards and lighting protection standards). The program shall include training requirements for applicable tasks for workers and establish procedures for providing required training to all workers. Documentation of training and a mechanism for reporting serious accidents to appropriate agencies shall be established.	S, C, O, D
96	Solar/Wind	Electrical	Electrical systems shall be designed to meet all applicable safety standards (e.g., National Electrical Code [NEC]) and comply with the interconnection requirements of the transmission system operator.	S
97	Solar/Wind	EMI	Design the project to reduce electromagnetic interference (EMI) (for example, impacts to radar, microwave, television, and radio transmissions) and comply with Federal Communications Commission (FCC) regulations. Conduct signal strength studies when proposed locations have the potential to affect FCC licensed transmissions. Reduce to nil potential or real interference with public safety communication systems (for example, radio traffic related to emergency activities) or the amateur radio bands.	S
98	Wind	EMI	In the event an installed wind energy development project results in electromagnetic interference (EMI), the operator shall work with the owner of the impacted communications system to resolve the problem. Additional warning information may also need to be conveyed to aircraft with onboard radar systems so that echoes from wind turbines can be quickly recognized.	O
99	Solar/Wind	Explosives	For the mitigation of explosive hazards, workers shall be required to comply with the OSHA	C, O, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			standard (29 CFR 1910.109) for the safe use of explosives and blasting agents.	
100	Solar/Wind	Traffic	A Traffic Management Plan shall be prepared for the site access roads to control hazards that could result from increased truck traffic (most likely during construction or decommissioning), to ensure that traffic flow would not be adversely affected and that specific issues of concern (e.g., the locations of school bus routes and stops) are identified and addressed. This plan shall incorporate measures such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configuration. The plan shall be developed in coordination with local planning authorities.	S, C, O, D
101	Wind	Meteorological towers	Meteorological towers installed for site monitoring and testing shall be inspected periodically (at least every 6 months) for structural integrity.	S
102	Solar/Wind	Aviation	The project shall be planned to comply with FAA regulations, including lighting requirements, and to avoid potential safety issues associated with proximity to airports, military bases or training areas, or landing strips.	S
103	Solar	Glare	For parabolic trough facilities, an evaluation of the potential exposure of the public to glare from parabolic trough mirrors shall be conducted. If there is a potential for exposure at levels that could cause retinal damage, measures to eliminate the exposure shall be implemented (e.g., slatted fencing to shield views from outside the facility).	S
104	Solar	Glare	A Heliostat Positioning Plan shall be prepared for power tower projects to avoid exposures to reflected sunlight that could cause retinal damage, temporary blindness, or distraction to operators of aircraft or motorized vehicles on roads in the vicinity of facilities.	S
105	Solar	Glare	Parabolic trough and power tower facilities shall develop a Glare Monitoring Plan to log, investigate, and respond to complaints about glare, either from heliostats or from the tower receivers.	S, O
106	Solar	Glare	For power tower facilities, the hazards associated with the tower and the glare from the heliostat mirrors shall be evaluated through coordination with local airports and evaluation of flight paths.	S, O
107	Solar	SF6	Because of the high global warming potential of SF6, the use of alternative dielectric fluids shall be considered. Alternatively, regular leak detection inspections shall be required to minimize the occurrence and impacts of SF6 leaks from facility piping.	S
108	Solar/Wind	Fire	Operators shall develop a Fire Management and Protection Plan to implement measures to minimize the potential for a human-caused fire and to respond to human-caused or natural-caused fires. Carry out the plan during all phases of project development. Train site workers to respond, as appropriate, to fires. Maintain a 30-foot firebreak within the fenced area containing	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			project facilities.	
109	Solar/Wind	Security	Project developers shall work with appropriate agencies (e.g., DOE and TSA) to address critical infrastructure and key resource vulnerabilities at renewable energy facilities, to minimize and plan for potential risks from natural events, sabotage, and terrorism.	S, O
110	Solar/Wind	Ordnance	Survey project sites for unexploded ordnance, especially if projects are within 20 miles of a current DOD installation or formerly used defense site.	S
Lands and Realty				
111	Solar/Wind	PLSS	Protection and preservation of evidence of the Public Land Survey System (PLSS) and related federal property boundaries is required of project developers. Prior to commencing any ground-disturbing activity, evidence of the PLSS and related property boundaries will be marked for protection. Coordination with BLM Cadastral Survey staff should occur for assistance with providing data, searching for and evaluating evidence, and locating and protecting monuments of the PLSS and related property boundaries from destruction. In some cases, resurveys, re-monumentation, and/or referencing of PLSS corners may be required prior to commencement of any surface disturbance.	S
112	Solar/Wind	Interconnections	In applications to appropriate lead agencies, provide a copy of the electric transmission interconnection study from the appropriate control agency. Include in the interconnection study an identification of the transmission impacts beyond the first point of interconnection and acceptable measures to mitigate/alleviate impacts to the transmission network system. When more than one alternative mitigation measure is identified, indicate in the applications the measure selected by the project developer. Provide for each selected mitigation measure, an environmental analysis sufficient to meet the CEQA requirements for indirect project impacts.	S
113	Wind	Decommissioning	Inoperative turbines shall be repaired, replaced, or removed in a timely manner. Requirements to do so shall be incorporated into the due diligence provisions of the rights-of-way authorization. Operators will be required to demonstrate due diligence in the repair, replacement, or removal of turbines; failure to do so may result in termination of the right-of-way authorization.	D
114	Solar/Wind	Decommissioning	Prior to the termination of the right-of-way authorization, a decommissioning plan shall be developed and approved by the BLM. The decommissioning plan shall include a site reclamation plan and monitoring program.	D
115	Solar/Wind	Decommissioning	All turbines, solar panels, and/or ancillary structures shall be removed from the site.	D
Native American Concerns				
116	Solar/Wind	Burial sites	Tribal burial sites shall be avoided. If avoidance is not possible, consultation with the lineal descendants or Tribal affiliates of the deceased shall be undertaken before removing a known burial. Remains and	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			objects s shall be protected and their treatment and disposition determined according to NAGPRA statutory procedures and regulations. A contingency plan for encountering unanticipated burials and funerary goods during construction, maintenance, or operation of a renewable energy facility shall be developed as part of a formalized agreement to address management and mitigation options for significant cultural resources (see Cultural Resources) in consultation with the appropriate Tribal governments and cultural authorities well in advance of any ground disturbances.	
117	Solar/Wind	Water resources	Springs and other water sources that are, or may be, sacred or culturally important shall be avoided whenever possible. If construction, maintenance, or operation activities must occur in proximity to springs or other water sources, appropriate measures, such as the use of geotextiles or silt fencing, shall be taken to prevent silt from degrading water sources. The effectiveness of these mitigating barriers shall be monitored. Measures for preventing water depletion impacts on spring flows shall also be employed. Particular mitigations shall be determined in consultation with the appropriate Native American Tribe(s).	S, C, O, D
118	Solar/Wind	Vegetation	Culturally important plant species shall be avoided when possible. When it is not possible to avoid these plant resources, consultations shall be undertaken with the affected Tribe(s). If the species is available elsewhere on agency-managed lands, guaranteeing access may suffice. For rare or less common species, establishing (transplanting) an equal amount of the plant resource elsewhere on agency-managed land accessible to the affected Tribe may be acceptable.	S, C, O, D
119	Solar/Wind	Wildlife	Culturally important wildlife species and their habitats shall be avoided. When it is not possible to avoid these habitats, renewable energy facilities shall be designed to minimize impacts on game trails, migration routes, and nesting and breeding areas of Tribally important species. Mitigation and monitoring procedures shall be developed in consultation with the affected Tribe(s).	S, C, O, D
120	Solar/Wind	Archaeology	Archaeological sites created by ancestral Native American populations shall be avoided whenever possible. However, when archaeological excavations are necessary, affiliated Tribe(s) shall be consulted in developing research designs and data recovery plans. Possible mitigations include scientific excavation; monitoring or participation in excavations by Tribal representatives; or approved curation of collections in tribal facilities that meet government standards to ensure appropriate preservation and management.	S, C, O, D
121	Solar/Wind	Art	Rock art (panels of petroglyphs and/or pictographs) shall be avoided whenever possible. These panels may be just one component of a larger cultural landscape, in which avoidance of all impacts may not be possible. Mitigation plans for eliminating or reducing (minimizing) potential impacts on rock art shall be formulated in consultation with the appropriate Tribal cultural authorities.	S, C, O, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
Noise - Vibration				
122	Solar/Wind	Noise baseline	Project developers shall take measurements to assess the existing background ambient sound levels both within and outside the project site and compare those with the anticipated noise levels associated with the proposed facility. The ambient measurement protocols of all affected land management agencies shall be considered and utilized. Nearby residences and likely sensitive human and wildlife receptor locations shall be identified at this time. Site facilities to avoid locations in close proximity to sensitive noise receptors (for example, residences, hospitals, and schools).	S
123	Wind	Equipment	Adhere to applicable wind turbine national or international acoustic design standards (for example, International Energy Agency, International Electrotechnical Commission, and the American National Standards Institute).	S
124	Solar/Wind	Timing	If residences or sensitive receptors are nearby, noisy construction and decommissioning activities shall be limited to the least noise-sensitive times of day (daytime between 7 a.m. and 7 p.m.) and weekdays. Quieter activities, such as instrumentation or interior installation, could be conducted at any time.	C, O, D
125	Solar/Wind	Monitoring/ mitigation	Prepare a noise monitoring and mitigation plan. Design the project to: minimize noise impacts to sensitive noise receptors, limit increases to less than a five to 10 dBA increase above ambient levels, and not exceed local noise standards. Address project generated noise impacts as much as possible. Consider acquiring lands to serve as buffers around the proposed facilities.	S
Paleontology				
126	Solar/Wind	Surveys	Project developers shall determine whether paleontological resources exist in a project area on the basis of the following: the sedimentary context of the area and its potential to contain paleontological resources (PFYC [potential fossil yield classification] Class, if it is available); a records search of published and unpublished literature for past paleontological finds in the area; coordination with paleontological researchers working locally in potentially affected geographic areas and geologic strata; and/or depending on the extent of existing information, the completion of a paleontological survey.	S
127	Solar/Wind	Mitigation	The Paleontological Resources Management Plan shall include a mitigation plan; mitigation may include avoidance, removal of fossils (data recovery), stabilization, monitoring, protective barriers and signs, or other physical or administrative protection measures. The Paleontological Resources Management Plan also shall identify measures to prevent potential looting, vandalism, or erosion impacts and address the education of workers and the public to make them aware of the consequences of unauthorized collection of fossils on public land.	S
128	Solar/Wind	Monitoring	If an area has a high potential but no fossils are observed during survey, monitoring by a qualified	C, O, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			paleontologist may be required by the designated lead agency during all excavation and earthmoving activities in the sensitive area. Development of a monitoring plan is recommended.	
129	Solar/Wind	Monitoring	If fossils are discovered during construction, the designated lead agency shall be notified immediately. Work shall be halted at the fossil site and continued elsewhere until a qualified paleontologist can visit the site and make site-specific recommendations for collection or other resource protection. The area of the discovery shall be protected to ensure that the fossils are not removed, handled, altered, or damaged.	C, O, D
Soils				
130	Solar/Wind	Geotechnical	Ground-disturbing geotechnical studies (e.g., geotechnical drilling) shall adhere to the permitting requirements specified by the BLM in 43 CFR 2920.	S, C
131	Solar/Wind	Construction	Construction grading shall be conducted in compliance with good industry practice (e.g., the American Society for Testing and Materials [ASTM] International standard methods) and other requirements (e.g., BLM and/or local grading and construction permits), as they apply.	C, O, D
132	Solar/Wind	Disturbance area	Existing roads, disturbed areas, and borrow pits shall be used. If new roads are necessary, they shall be designed and constructed to the appropriate road design standards, such as those described in BLM Manual 9113. The specifications and codes developed by the U.S. Department of Transportation (DOT) are also to be taken into account.	S, C, O, D
133	Solar/Wind	Drainages	Land disturbance (including crossings) in natural drainage systems and groundwater recharge zones, specifically ephemeral washes and dry lake beds, are to be avoided. Any structures crossing drainages must be located and constructed so that they do not decrease bank and channel stability or increase water volume or velocity. Developers shall obtain all applicable federal and state permits.	C, O, D
134	Solar/Wind	Drainages	Solar and/or wind facilities or components (e.g., heliostats, panels, dishes, troughs, turbines, etc.) shall not be placed in natural drainage ways.	S, C, O, D
135	Solar/Wind	Drainages	Adequate space (i.e., setbacks) between renewable energy facilities and natural washes is to be maintained to preserve their hydrological function and provide a buffer for flood control.	S, C, O, D
136	Solar/Wind	Roads	New roads shall be designed to follow natural land contours and avoid or minimize hill cuts in the project area and avoid existing desert washes. Siting of new roads and walking trails (if any) is to be consistent with the designation criteria specified by the BLM in 43 CFR 8342.1.	S
137	Solar/Wind	Roads	Roads shall be designed to avoid erosion and changes in surface water runoff based on local meteorological conditions, soil moisture, and erosion potential.	S
138	Solar/Wind	Roads	Temporary roads shall be designed with eventual reclamation in mind.	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
139	Solar/Wind	Erosion control	Erosion controls that comply with county, State, and Federal standards shall be applied. Practices such as jute netting, silt fences, and check dams shall be applied near disturbed areas. Erosion control structures (e.g., rock lining or apron) shall be added at culvert outlets to reduce flow velocity and minimize the potential for scouring.	C, O, D
Transportation				
140	Solar/Wind	Easements/ encroachments	Easements could be required for public roadway corridors through a site to maintain proper traffic flows and retain more direct routing for the local population.	S
141	Solar/Wind	Easements/ encroachments	Obtain encroachment permits from appropriate agencies.	C, O, D
142	Solar/Wind	Transportation plans	An access road siting and management plan shall be prepared incorporating existing BLM standards regarding road design, construction, and maintenance such as those described in the BLM 9113 Manual and the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (revised 2007).	S
143	Solar/Wind	Transportation plans	A transportation plan shall be developed, particularly for the transport of turbine components, main assembly cranes, and other large pieces of equipment. The plan shall consider specific object sizes, weights, origin, destination, and unique handling requirements and shall evaluate alternative transportation approaches. In addition, the process to be used to comply with unique state requirements and to obtain all necessary permits shall be clearly identified.	S
144	Solar/Wind	Transportation plans	A traffic management plan shall be prepared for the site access roads to ensure that no hazards would result from increased truck traffic and that traffic flow would not be adversely impacted. This plan shall incorporate measures such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configuration.	S
145	Solar/Wind	Design	Existing roads shall be used, but only if in safe and environmentally sound locations. If new roads are necessary, they shall be designed and constructed to the appropriate BLM road design standards and be no higher than necessary to accommodate their intended functions (e.g., traffic volume and weight of vehicles). Excessive grades on roads, road embankments, ditches, and drainages shall be avoided, especially in areas with erodible soils. Special construction techniques shall be used, where applicable. Abandoned roads and roads that are no longer needed shall be recontoured and revegetated.	S, C, O, D
Visual Resources				
146	Solar/Wind	VRM	Project developers shall consult with the BLM early in project planning to help determine the proposed project's conformance to the applicable RMP's VRM Class designation. VRM	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			considerations shall take place early in the project planning phase in accordance with BLM VRM manual and handbooks. Operators shall utilize digital terrain mapping tools at a landscape/viewshed scale for site planning and design, visual impact analysis, and visual impact mitigation planning and design. Visual mitigation planning and design shall be performed through field assessments, applied GPS technology, photo documentation, use of computer-aided design and development software, and visual simulations to reflect a full range of visual resource best management practices. The digital terrain mapping tools shall be at a resolution and contour interval suitable for site design and accurate placement of proposed developments into the digital viewshed. Visual simulations shall be prepared and evaluated in accordance with BLM Handbook H-8432-1, or other agency requirements, to create spatially accurate depictions of the appearance of proposed facilities. Simulations shall depict proposed project facilities from Key Observation Points and other visual resource sensitive locations.	
147	Solar/Wind	VRM	The BLM VRM class values, including Scenic Quality, Sensitivity, and Distance Zones, shall be factored into the project planning, design, and decision making, and demonstrate how the visual values influence project design and document how impacts on these values are minimized through consideration for proposed project location and its relationship to the surrounding viewshed.	S
148	Solar/Wind	VRM	Facilities proposed within the foreground/middleground distance zone (0 to 5 mi [0 to 8 km]) of National Scenic Highways and All-American Roads shall include measures to minimize the profile of all structures related to the facility so that the viewshed from the scenic highway meets VRM objectives. The project developer shall evaluate the potential visual impacts on National Scenic Highways and All-American Roads associated with the proposed project and identify appropriate mitigation measures for inclusion as stipulations in the Plan of Development.	S
149	Solar/Wind	Design	The public shall be involved and informed about the visual site design elements of the proposed renewable energy facilities. Possible approaches include conducting public forums for disseminating information, offering organized tours of operating wind developments, and using computer and visualization simulations in public presentations.	S
150	Solar/Wind	Design	A qualified, licensed, and experienced professional landscape architect shall be a part of the planning teams evaluating visual resource issues.	S
151	Solar/Wind	Design	BLM field office and locally based public shall be consulted to provide input on identifying important visual resources in the project area and on the siting and design process.	S
152	Solar/Wind	Design	Project developers shall also consult with the respective land management agencies assigned administrative responsibility Special designations, such as WA, NSHT, WSR, NPs, and NWRs	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			located within the project's viewshed.	
153	Solar/Wind	Design	Project developers shall obtain engineering-design-quality topographical data and use digital terrain mapping tools at a landscape-viewshed scale for project location selection, site planning and design, visual impact analysis, and visual impact mitigation planning and design.	S
154	Solar/Wind	Design	Visual mitigation planning and design shall be performed through field assessments, applied global positioning system (GPS) technology, photo documentation, use of computer-aided design and development software, 3-D GIS modeling software and imaging software to depict visual simulations to reflect a full range of visual resource mitigation measures.	S
155	Solar/Wind	Design	Project developers shall exhaust opportunities of projects to be sited outside the viewsheds of KOPs, or if facilities must be sited within view of KOPs then they shall be sited as far away as possible, since visual impacts generally diminish as viewing distance increases.	S
156	Solar/Wind	Design	Structures and roads shall be designed and located to minimize and balance cuts and fills. Retaining walls, binwalls, half bridges, and tunnels shall be used to reduce cut and fill.	S
157	Solar/Wind	Surface disturbance	Natural or previously excavated bedrock landforms shall be sculpted and shaped when excavation of these landforms is required. Percent backslope, benches, and vertical variations shall be integrated into a final landform that repeats the natural shapes, forms, textures, and lines of the surrounding landscape. The earthen landform shall be integrated and transitioned into the excavated bedrock landform. Sculpted rock face angles, bench formations, and backslope need to adhere to the natural bedding planes of the natural bedrock geology. Half-case drill traces from presplit blasting shall not remain evident in the final rock face. The color contrast from the excavated rock faces shall be removed by color treating with a rock stain. Native vegetation (where feasible, or a mix of native and non-native species if necessary to ensure successful revegetation) shall be reestablished with the benches and cavities created within the created bedrock formation.	C, O, D
158	Solar/Wind	Surface disturbance	The project developer shall maintain revegetated surfaces until a self-sustaining stand of vegetation is reestablished and visually adapted to the undisturbed surrounding vegetation. No new disturbance shall be created during operations without completion of a VRM analysis and approval by the authorized officer.	C, O, D
159	Solar/Wind	Special areas	Specific to NHTs, but possibly pertaining to other special designations, NPs and NWRs: • For applications that include remnants of a National Historic Trail, are located within the viewshed of a National Historic Trail's designated centerline, or include or are within the viewshed of a trail eligible for listing in the NRHP by virtue of its integrity of setting and feeling, the applicant shall evaluate the	S, C, O, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			potential visual impacts on the trail, minimize, avoid, or mitigate adverse effects, and identify appropriate mitigation measures as stipulations in the Plan of Development (see also Cultural Resources). • Because the landscape setting observed from national historic sites, national trails, and Tribal cultural resources may be a part of the historic context contributing to the historic significance of the site or trail, project siting project siting will strive to avoid locating facilities that would alter the visual setting such that they would reduce the historic significance or function.	
160	Solar/Wind	Lighting	A Lighting Plan shall be prepared that documents how lighting will be designed and installed to minimize night-sky impacts during facility construction and operations phases. Lighting for facilities shall not exceed the minimum number of lights and brightness required for safety and security and shall not cause excessive reflected glare. Full cut-off luminaires shall be utilized to minimize uplighting. Lights shall be directed downward or toward the area to be illuminated. Light fixtures shall not spill light beyond the project boundary. Lights in high-illumination areas not occupied on a continuous basis shall have switches, timer switches, or motion detectors so that the lights operate only when the area is occupied. Where feasible, vehicle-mounted lights shall be used for night maintenance activities. Wherever feasible, consistent with safety and security, lighting shall be kept off when not in use. The Lighting Plan shall include a process for promptly addressing and mitigating complaints about potential lighting impacts.	S, C, O
161	Solar/Wind	Color	Multiple color camouflage technology applications shall be considered for projects within sensitive viewsheds and with visibility distance between 0.25 and 2 mi (0.40 and 3.20 km). BLM guidance on the use of color to mitigate visual impacts shall be consulted.	C, O
162	Solar	Glare	Solar facilities shall be sited and designed properly to eliminate glinting and glare effects on roadway users, nearby residences, commercial areas or other highly sensitive viewing locations, or reduce it to the lowest achievable levels. A study to assess accurately and to quantify potential glinting and glare effects and to determine potential health, safety, and visual impacts associated with glinting and glare effects shall be conducted by qualified individuals using appropriate and commonly accepted software and procedures. The study results must be made available to the BLM in advance of project approval. If the project design is changed during the siting and design process such that substantial changes to glinting and glare effects may occur, glinting and glare effects shall be recalculated, and the study results made available to the BLM.	S
163	Solar	Glare	Mirrors/heliostats shall be deployed and operated to avoid high-intensity light (glare) being reflected toward off-site ground receptors. Where off-site glare is unavoidable, fencing with	S, C, O

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			privacy slats or similar screening materials shall be employed.	
164	Solar/Wind	Glare	Commercial symbols or signs and associated lighting on buildings or other structures shall be prohibited.	S, C, O
165	Solar/Wind	Transmission	Electricity transmission-distribution projects shall utilize non-specular conductors and non-reflective coatings on insulators.	S, O
166	Solar/Wind	Reclamation	A Decommissioning and Site Reclamation Plan shall be developed, approved by the BLM, and implemented. The plan shall require that all aboveground and near-ground structures be removed. Some structures shall be removed only to a level below the ground surface that will allow reclamation/restoration. Topsoil from all decommissioning activities shall be salvaged and reapplied during final reclamation. The plan shall include provisions for monitoring and determining compliance with the project's visual mitigation and reclamation objectives.	D
Water Resources				
167	Solar	Water supply	Project developers shall plan to implement water conservation measures relating to solar energy technology water needs in order to reduce project water requirements. Developers would minimize the consumptive use of fresh water for power plant cooling by, for example, using dry cooling, using recycled or impaired water, or selecting solar energy technologies that do not require cooling water.	S, O
168	Solar/Wind	Water supply	Project developers shall quantify water source, timing, and use requirements for project construction, operation, and decommissioning.	S, C, O, D
169	Solar/Wind	Water supply	Project developers shall coordinate with appropriate water rights agencies for securing water rights. Project developers shall choose appropriate water sources with respect to available water rights and management practices, as well as consideration of maintaining aquatic, riparian, and other water-dependent sources.	S
170	Solar/Wind	Groundwater	Project developers who plan to use groundwater shall develop and implement a groundwater Water Resources Monitoring and Mitigation Plan, which includes monitoring the effects of groundwater withdrawal for project uses, vegetation restoration and dust control uses during decommissioning and aquifer recovery after project decommissioning. Monitoring frequency shall be decided on a site-specific basis and in coordination with federal, state, and local agencies managing groundwater resources of the region.	S, C, O, D
171	Solar/Wind	Groundwater	If groundwater use is proposed, project developers shall ensure that a comprehensive analysis of the groundwater basin is provided and that the following potential significant impacts are evaluated: • Creation or exacerbation of overdraft conditions and their potential to cause	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			subsidence and loss of aquifer storage capacity; • Use that cause injury to other water rights claims in the basin; • Estimates of the total cone of depression considering cumulative drawdown from all potential pumping in the basin, including the project, for the life of the project through the decommissioning phase; • Changes in water quality that affect other beneficial use; and • Effects on groundwater dependent ecosystems such as springs, seeps, and wetlands that provide water for plants and animals.	
172	Solar/Wind	Groundwater	Groundwater wells constructed during any stage of the project would conform to state and local standards and records shall include: • Legal description (township, range, section, and quarter section);Project map with proposed and existing well locations; • Well design characteristics: casing diameter, screened interval(s), well depth, and static water level; • Results of groundwater pumping tests or other tests done in the well; • Anticipated pumping capacity and peak pumping rates; • Identification of the groundwater aquifer and its hydrogeologic characteristics; • Estimation of the potential cone of depression that might be produced by the proposed pumping throughout the lifetime of a project by using an analytical or numerical model; and • Estimate of the total cone of depression considering cumulative drawdown from all potential pumping in the basin, including the project, for the life of the project through the decommissioning phase (also using an analytical or numerical model).	S
173	Solar/Wind	Surface water	Project developers who plan to use surface water sources shall develop a Water Resources Monitoring and Mitigation Plan that includes monitoring changes in flows, volumes, and water quality during construction and operations, as well as their recovery during decommissioning. Monitoring frequency shall be decided on a site-specific basis and in coordination with federal, state, and local agencies managing surface water resources of the region.	S
174	Solar/Wind	Surface water	Project developers shall plan to avoid impacts on existing surface water features, including streams, lakes, wetlands, floodplains, intermittent streams, playas, and	S, C, O, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			ephemeral washes/drainages (any unavoidable impacts would be minimized), in the development and in nearby regions according to: • All sections of the Clean Water Act 33 USC §1251 et seq. (1972), Safe Drinking Water Act 42 USC §300f et seq. (1974), and Arizona Executive Order No. 91-6 Protection of Riparian Areas (Feb. 14, 1991); • Executive Order No. 11988 Floodplain Management (May 24, 1977) and Executive Order No. 11990 Protection of Wetlands (May 24, 1977); • EPA stormwater management guidelines (EPA 2009a) and applicable state and local stormwater management guidelines; • Wild and Scenic Rivers System (Public Law 90-542; 16 U.S.C. 1271 et seq.).	
175	Solar/Wind	Water quality	Potable water supplies shall meet all required federal, state, and local water quality standards (e.g. Sections 303 and 304 of the CWA).Developers shall identify wastewater treatment measures and new or expanded facilities, if any, to be included as part of the facility's NPDES permit.	C, O, D
176	Solar/Wind	Water quality	No project and/or project related activities shall degrade, negatively effect, and/or contribute to impairment of existing surface water quality conditions for waterbodies that are Federally designated on the CWA section 303(d) list of impaired surface waters and existing water quality shall be maintained and protected in a surface water that is classified as an Outstanding Arizona Water (OAW) under Arizona Administrative Code R18-11-112 or designated Arizona's Outstanding Natural Resource Waters.	C, O, D
177	Solar/Wind	Water quality	When an herbicide/pesticide is used to control vegetation, the climate, soil type, slope, and vegetation type shall be considered in determining the risk of herbicide/pesticide contamination (BLM 2006a). Additionally, an Animal, Pest, and Vegetation Control Plan shall be developed to ensure that applications are conducted within the framework of BLM and U.S. Department of the Interior (DOI) policies and standard operating procedures and entail only the use of EPA-registered pesticides/herbicides that also comply with state and local regulations.	C, O, D
178	Solar/Wind	Flooding	Projects developers shall maintain the pre-development flood hydrograph for all storms up to and including the 100-yr rainfall event. All stormwater retention and/or infiltration and treatment systems shall also be designed for all storms up to and including the 100-yr storm event. As part of a Spill Prevention and Emergency Response Plan, measures to prevent potential groundwater and surface water contamination shall be identified.	S, C, O, D
179	Solar/Wind	Hydrology	Developers shall be required to conduct a detailed hydrologic study demonstrating a clear understanding of the local surface water and groundwater hydrology. At a minimum this	S

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			hydrologic study shall include: • Quantification of physical characteristics describing surface water features, such as streamflow rates, stream cross-sections, channel routings, seasonal flow rates (intermittent streams), peak flow rates (ephemeral washes/drainages), sediment characteristics and transport rates, lake depths, and surface areas of lakes, wetlands, and floodplains; • Hydrologic analysis and modeling to define the 100-yr, 24-hour rainfall event for the project area and calculation of projected runoff from this storm at site; • Hydrologic analysis and modeling to identify 100-yr floodplain boundaries of any surface water feature on the site; • Quantification of physical characteristics describing the groundwater aquifer, such as physical dimensions of the aquifer, sediment characteristics, confined/unconfined conditions, hydraulic conductivity and transmissivity distribution of the aquifer, groundwater surface elevations, and groundwater flow processes (direction, recharge/discharge, current basin extractions, and surface water-groundwater connectivity); • Quantification of regional climate including seasonal and long-term information on temperatures, precipitation, evaporation, and evapotranspiration; and • Quantification of the sustainable yield of surface waters and groundwater available to the project. Project developers shall evaluate the water sources in terms of existing water rights and management plans for adequacy to serve project demands while maintaining aquatic, riparian, and other water-dependent resources.	
180	Solar/Wind	Wastewater	Developers shall coordinate with state/local regulatory agencies regarding the issuance of permits or "will-serve" agreements for development and use of water, and/or the operation of on-site wastewater treatment systems.	S, O
181	Solar/Wind	Wastewater	Comply with local requirements for permanent, domestic water use and wastewater treatment. The treatment of sanitary and industrial wastewater either on-site or off-site would comply with federal, state, and local regulations. Any discharges to surface waters would need NPDES permitting. Any storage or treatment of wastewater on-site shall have proper lining of holding ponds and tanks to prevent leaks.	C, O, D
182	Solar/Wind	Stormwater	The facility shall obtain and comply with a construction stormwater permit through the EPA or state-run NPDES program (whichever applies within the state). Additionally, the EPA requires	S, C, O, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
			any development larger than 20 acres (0/08 km2) begun after August 2011 to comply with a requirement to monitor construction discharges for turbidity concentrations (EPA 2009c).	
183	Solar/Wind	Mitigation	The Project Proponent will compensate for the loss of ephemeral drainage habitat through in-kind habitat restoration of a portion of the main drainage at a minimum ratio of 2:1. Restoration components may include removal of accumulated sediment, bank stabilization, planting of vegetation, sediment control measures, establishing protective habitat buffers, placing a conservation easement over the restored drainage and buffer, and funding an endowment that will provide for long-term management.	C
184	Solar/Wind	Mitigation	A Drainage, Erosion, and Sedimentation Control Plan shall be developed that ensures protection of water quality and soil resources, demonstrates no increase in off-site flooding potential, and includes provisions for stormwater and sediment retention on the project site. The plan would identify site surface water runoff patterns and develop mitigation measures that prevent excessive and unnatural soil deposition and erosion throughout and downslope of the project site and project-related construction areas. The plan would achieve the following: • Runoff from parking lots, roofs, or other impervious surfaces would be directed to the immediate landscape or to retention basins prior to being released downgradient of the site. • Any landscaping used for stormwater treatment shall not be an invasive species and preferably a native species and would require little or no irrigation and would be recessed to create retention basins/areas used to capture runoff. • The amount of area covered by impervious surfaces would be reduced through the use of permeable pavement or other pervious surfaces. • Natural drainages and a pre-project hydrograph would be maintained for the area. Siting in identified 100-yr floodplains shall not be allowed within the development.	S, C, D
Wild Horses and Burros				
185	Solar/Wind	Mitigation	Activities of project developers shall be coordinated with the designated lead agency to ensure that impacts on wild horses and burros and their management areas are minimized. Issues that would need to be addressed could include the installation of fencing and access control, provision for movement corridors, delineation of open range, traffic management (e.g., vehicle speeds), compensatory habitat restoration, and access to or development of water sources.	S, C, O, D

Table B-1 *(continued)*
Design Features

No.	Technology	Topic	Description of Measure	Phase
Wildfire				
186	Solar/Wind	Noxious weeds	A vegetation plan designed to prevent the establishment of non-native, invasive species on the solar energy facility and along transmission line ROWs and roads shall be developed and implemented to minimize the potential for increasing wildland fire frequency.	S, C, O, D
187	Solar/Wind	Firebreak	The ROW for the renewable energy facilities shall be sized to ensure there is a large enough firebreak inside the ROW so there would be no threat to facilities either from wildland fire approaching from outside the ROW or from fire moving from inside to outside of the ROW. This distance should be determined through coordination with fire management staff and should be undertaken specifically to remove the need for protective responses, both active and passive (e.g., vegetation manipulation), by the designated lead agency, state, and local fire organizations.	S

Table B-2
Required Plans

Construction, Operation, and Maintenance Plan	Applicants are required to prepare a COM Plan that incorporates the stipulations and conditions of each agency. The COM Plan will provide information on the project's design, construction, operation and maintenance, and environmental mitigation measures that will be used and implemented by construction contractors and personnel.
Access Road Siting and Management Plan	An access road siting and management plan shall be prepared incorporating existing BLM standards regarding road design, construction, and maintenance such as those described in the BLM 9113 Manual and the Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development (revised 2007).
Compensatory Wetland Mitigation & Monitoring Plan	Compensatory Wetland Mitigation and Monitoring Plan (CWMMP) describes the mitigation of potential impacts to wetlands that would result from a proposed project. The proposed mitigation measures set forth in this Plan are intended to compensate for project impacts. The proposed compensatory mitigation measures described in this Plan address the direct, indirect, and cumulative impacts associated with a proposed project. The overall objective of the CWMMP is to ensure that there will be no net loss of wetland function or area.
Decommissioning & Site Reclamation Plan (Solar & IM 2009-043)	Prior to the termination of the right-of-way authorization, a decommissioning plan shall be developed and approved by the BLM. The decommissioning plan shall include a site reclamation plan and monitoring program. A Decommissioning and Site Reclamation Plan specific to the project shall be developed and implemented. Baseline data shall be collected in each project area as a benchmark for measuring the success of reclamation efforts. The plan shall contain an adaptive management component that allows for the incorporation of lessons learned from monitoring data. The plan shall require that land surfaces be returned to pre-development contours to the greatest extent feasible immediately following decommissioning. The plan shall focus on the establishment of native plant communities similar to those present in the vicinity of the project site. The plan shall be designed to expedite the re-establishment of vegetation and require restoration to be completed as soon as practicable. To ensure rapid and successful re-establishment efforts, the plan shall specify site-specific measurable success criteria, including target dates, which shall be developed in coordination with the BLM and which shall be required to be met by the operator. Vegetation re-establishment efforts shall continue until all success criteria have been met. Bonding to cover the full cost of vegetation re-establishment shall be required. Species used for vegetation re-establishment shall consist of native species dominant within the plant communities existing in adjacent areas having similar soil conditions. The plan shall require the use of weed-free seed mixes of native shrubs, grasses, and forbs of local sources where available. When available, seed of known origin as labeled by state seed certification programs shall be used. Local native genotypes shall be used. If cultivars of native species are used, certified seed (i.e., blue tag) shall be used. "Source identified" seed (i.e., yellow tag) shall be used when native seed is collected from wildland sites. The cover, species composition, and diversity of the re-established plant community shall be similar to those in the vicinity of the site. In areas where suitable native species are unavailable, other plant species approved by the BLM could be used. If non-natives are necessary they shall be non-invasive, non-competitive, and ideally are short-lived, have low reproductive capabilities, or be self-pollinating to prevent gene flow into the native community. Non-natives used shall not exchange genetic material with common native plant species. The plan shall also include site-specific, measurable success criteria that must be met. The plan shall be developed in coordination with appropriate federal and state agencies.

Table B-2 *(continued)*
Required Plans

	The plan shall require that all above ground and near-ground structures be removed. Some structures shall be removed only to a level below the ground surface that will allow reclamation/restoration. Topsoil from all decommissioning activities shall be salvaged and reapplied during final reclamation. The plan shall include provisions for monitoring and determining compliance with the project's visual mitigation and reclamation objectives. Reclamation of the construction site shall begin immediately after construction to reduce the likelihood of visual contrasts associated with erosion and invasive weed infestation and to reduce the visibility of affected areas as quickly as possible.
Drainage, Erosion & Sedimentation Control Plan	A Drainage, Erosion, and Sedimentation Control Plan shall be developed that ensures protection of water quality and soil resources, demonstrates no increase in off-site flooding potential, and includes provisions for stormwater and sediment retention on the project site. The plan would identify site surface water runoff patterns and develop mitigation measures that prevent excessive and unnatural soil deposition and erosion throughout and downslope of the project site and project-related construction areas. The plan would achieve the following: • Runoff from parking lots, roofs, or other impervious surfaces would be directed to the immediate landscape or to retention basins prior to being released downgradient of the site • Any landscaping used for stormwater treatment would require little or no irrigation and would be recessed to create retention basins/areas used to capture runoff • The amount of area covered by impervious surfaces would be reduced through the use of permeable pavement or other pervious surfaces • Natural drainages and a pre-project hydrograph would be maintained for the area
Dust Abatement Plan	Plants, wildlife, and their habitats shall be protected from fugitive dust through measures included in the facility's Dust Abatement Plan.
Ecological Resources Mitigation & Monitoring Plan	A vegetation plan designed to prevent the establishment of non-native, invasive species on the solar energy facility and along transmission line ROWs and roads shall be developed and implemented to minimize the potential for increasing wildland fire frequency An Ecological Resources Mitigation and Monitoring Plan shall be developed to avoid, minimize, or mitigate adverse impacts on important ecological resources. The plan shall include but not necessarily be limited to the following elements: • Revegetation, soil stabilization, and erosion reduction measures that shall be implemented to ensure that all temporary use areas are restored. The plan shall require that restoration occur as soon as possible after completion of activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats. • Mitigation and monitoring unavoidable impacts on waters of the United States, including wetlands. • Compensatory mitigation and monitoring for significant direct, indirect, and cumulative impacts on and loss of habitat for special status plant and animal species. • Demonstration of compliance of the project with the regulatory requirements of the Bald and Golden Eagle Protection Act. The plan shall be developed in coordination with the USFWS. • Measures to protect birds (including migratory species protected under the

Table B-2 *(continued)*
Required Plans

	Migratory Bird Treaty Act) developed in coordination with the appropriate federal and state agencies (e.g., BLM, USFWS, and state resource management agencies). • Measures to mitigate and monitor impacts on special status species developed in coordination with the appropriate federal and state agencies (e.g., BLM, USFWS, and state resource management agencies) • Monitoring the potential for increase in predation of special status species (especially desert tortoise) from ravens and other species that are attracted to developed areas and opportunistically use tall structures to spot vulnerable prey. • Clearing and translocation of special status species, including the steps to implement the translocation as well as the follow-up monitoring of populations in the receptor locations, as determined in coordination with the appropriate federal and state agencies. The need for a Special Status Species Clearance and Translocation Plan shall be determined on a project-specific basis • Prepare a project specific ecological mitigation and monitoring plan in cooperation with and that meets the approval of permitting agencies. Carry out the plan during all phases of the project and, in general, identify appropriate mitigation levels to compensate for significant direct, indirect, and cumulative impacts, including habitat, special status plant, and wildlife species losses. Address at a minimum: o Biological resource mitigation, monitoring, and compliance measures required by federal, state, and local applicable permitting agencies. o Documentation (based on surveys) of sensitive plant and wildlife expected to be affected by all phases of the project (project construction, operation, abandonment, and decommissioning). Agencies may request additional surveying, based on the documentation or past experience working with the resources. Include measures to avoid or minimize impacts to species and habitat. o A detailed description of measures to minimize or mitigate permanent and temporary disturbances from construction activities. o All locations on a map, at an approved scale, of sensitive plant and wildlife areas subject to disturbance and areas requiring temporary protection and avoidance during construction. o Aerial photographs or images, at an approved scale, of areas to be disturbed during project construction activities. o Duration for each type of monitoring and a description of monitoring methodologies and frequency. o Performance standards and criteria to be used to determine if/when proposed mitigation is or is not successful. o All standards and remedial measures to be implemented if performance standards and criteria are not met. o A closure/decommissioning or abandonment plan, including a description of funding mechanism(s).
Fire Management & Protection Plan	A Fire Management and Protection Plan shall be developed to implement measures to minimize the potential for a human-caused fire to affect ecological resources and respond to natural fire situations. A Fire Management and Protection Plan shall be developed to implement measures to minimize the potential for fires associated with substances used and stored at the site. The flammability of the specific HTF used at the facility shall be considered. Operators shall develop a Fire Management and Protection Plan to implement

Table B-2 *(continued)*
Required Plans

	measures to minimize the potential for a human-caused fire and to respond to human-caused or natural-caused fires. Carry out the plan during all phases of project development. Train site workers to respond, as appropriate, to fires. Maintain a 30-foot firebreak within the fenced area containing project facilities.
Glint & Glare Assessment, Mitigation & Monitoring Plan	A study to assess accurately and to quantify potential glinting and glare effects and to determine potential health, safety, and visual impacts associated with glinting and glare effects shall be conducted by qualified individuals using appropriate and commonly accepted software and procedures. The study results must be made available to the BLM in advance of project approval. If the project design is changed during the siting and design process such that substantial changes to glinting and glare effects may occur, glinting and glare effects shall be recalculated, and the study results made available to the BLM. Parabolic trough and power tower facilities shall develop a Glare Monitoring Plan to log, investigate, and respond to complaints about glare, either from heliostats or from the tower receivers.
Habitat Restoration & Management Plan (Solar & IM 2009-043)	A habitat restoration plan shall be developed to avoid, minimize, or mitigate negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. The plan shall identify reclamation, soil stabilization, and erosion reduction measures that shall be implemented to ensure that all temporary use areas are restored. The plan shall require that restoration occur as soon as possible after completion of activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.
Heliostat Positioning Plan	A Heliostat Positioning Plan shall be prepared for power tower projects to avoid exposures to reflected sunlight that could cause retinal damage, temporary blindness, or distraction to operators of aircraft or motorized vehicles on roads in the vicinity of facilities. The plan should also avoid use of "standby points" (i.e., focal points away from the receiver vessel when all mirrors are not needed and some are in standby mode), but rather keep reflected beams dispersed to avoid impacts to birds through incineration.
Historic Properties Treatment Plan	Retain a qualified cultural resources specialist to write and carry out a monitoring and mitigation plan or agreement, when applicable, and to be available if cultural resources are encountered during construction. Avoidance of known cultural resources is generally the preferred resolution option; include in the plan measures to protect avoided resources during construction and to prevent looting/vandalism and erosion. If project impacts to known NRHP-eligible cultural resources are unavoidable, data recovery may be requested; include a data recovery strategy in the plan. The project developer may also be asked by the appropriate lead agency to include additional measures for addressing the discovery of previously unknown cultural resources during construction. Consider the following measures, at a minimum: • Hire a qualified archaeological monitor to oversee project excavations. • Develop and use a cultural resources construction personnel training program to promote cultural resources identification and lawful and appropriate response to discoveries. • Notify involved agencies of unexpected cultural or historical resources discoveries during construction. The project developer may be asked or ordered to cease construction in the vicinity of the discovery to allow evaluation and formulation of appropriate mitigation measures. • If human remains are discovered, cease construction and consult with the lead agencies. The agencies will likely follow particular state and federal laws that

Table B-2 *(continued)*
Required Plans

	address the treatment of human remains. • Where unavoidable impacts from project construction are expected, recover data from newly discovered NRHP-eligible cultural resources. • Have the cultural resources specialist prepare a report documenting archaeological monitoring and data recovery activities. Project proponents should expect to provide input to lead agency-prepared mitigation plans, agreement documents and related historic properties treatment plans. Treatment plans will guide: • Completion of a 100 percent archaeological surface survey (if not completed earlier in the permitting/pre-construction phase). • Outstanding geoarchaeological investigations. • Evaluation of newly identified cultural resources for NRHP eligibility. • Assessment of project impacts to NRHP-eligible cultural resources. • Development of measures to address the effects of the project on such eligible resources to avoid or reduce impacts as much as possible. IM 2009-043 - Cultural Resources Management Plan If cultural resources are present at the site, or if areas with a high potential to contain cultural material have been identified, a cultural resources management plan (CRMP) shall be developed. This plan shall address mitigation activities to be taken for cultural resources found at the site. Avoidance of the area is always the preferred mitigation option. Other mitigation options include archaeological survey and excavation, and monitoring. If an area exhibits a high potential, but no artifacts were observed during an archaeological survey, monitoring by a qualified archaeologist may be required during all excavation and earthmoving in the high-potential area. A report shall be prepared documenting these activities. The CRMP also shall (1) establish a monitoring program, (2) identify measures to prevent potential looting/vandalism or erosion impacts, and (3) address the education of workers and the public to make them aware of the consequences of unauthorized collection of artifacts and destruction of property on public lands.
Integrated Vegetation Management Plan	An Integrated Vegetation Management Plan shall be developed that is consistent with applicable regulations and agency policies for the control of noxious weeds and invasive plant species. The plan shall address monitoring; ROW vegetation management; the use of certified weed-free seed and mulching; the cleaning of vehicles to avoid the introduction of invasive weeds; and the education of personnel on weed identification, the manner in which weeds spread, and the methods for treating infestations. For transmission line ROWs, the plan shall be consistent with the existing vegetation management plan for that ROW. Principles of integrated pest management, including biological controls, shall be used to prevent the spread of invasive species. The plan shall include periodic monitoring, reporting, and immediate eradication of noxious weed or invasive species occurring within all managed areas. A controlled inspection and cleaning area shall be established to visually inspect construction equipment arriving at the project area and to remove and collect seeds that may be adhering to tires and other equipment surfaces. To prevent the spread of invasive species, project developers shall work with the local BLM field office to determine whether a pre-activity survey is warranted, and if so, conduct the survey. If invasive plant species are present, project developers shall work with the local BLM field office to develop a control strategy. The plan shall include a post-construction monitoring element that incorporates adaptive management protocols.

Table B-2 *(continued)*
Required Plans

Lighting Plan	A Lighting Plan shall be prepared that documents how lighting will be designed and installed to minimize night-sky impacts during facility construction and operations phases. Lighting for facilities shall not exceed the minimum number of lights and brightness required for safety and security and shall not cause excessive reflected glare. Full cut-off luminaires shall be utilized to minimize uplighting. Lights shall be directed downward or toward the area to be illuminated. Light fixtures shall not spill light beyond the project boundary. Lights in high-illumination areas not occupied on a continuous basis shall have switches, timer switches, or motion detectors so that the lights operate only when the area is occupied. Where feasible, vehicle-mounted lights shall be used for night maintenance activities. Wherever feasible, consistent with safety and security, lighting shall be kept off when not in use. The Lighting Plan shall include a process for promptly addressing and mitigating complaints about potential lighting impacts.
Noxious Weeds & Invasive Species Plan (IM 2009-043 & SPEIS)	Operators shall develop a plan for control of noxious weeds and invasive species, which could occur as a result of new surface disturbance activities at the site. The plan shall address monitoring, education of personnel on weed identification, the manner in which weeds spread, and methods for treating infestations. The use of certified weed-free mulch and certified weed-free seed shall be required. If trucks and construction equipment are arriving from locations with known invasive vegetation problems, a controlled inspection and cleaning area shall be established to visually inspect construction equipment arriving at the project area and to remove and collect seeds that may be adhering to tires and other equipment surfaces.
Nuisance Animal & Pest Control Plan (IM 2009-043 - Integrated Pest Management Plan)	An Animal, Pest, and Vegetation Control Plan shall be developed to ensure that applications are conducted within the framework of BLM and U.S. Department of the Interior (DOI) policies and standard operating procedures and entail only the use of EPA-registered pesticides/herbicides that also comply with state and local regulations. Any vehicle-wildlife collisions shall be immediately reported to security. Observations of potential wildlife problems, including wildlife mortality, shall be immediately reported to the BLM or other appropriate agency authorized officer. Procedures for removal of wildlife carcasses on-site and along access roads shall be addressed in the Animal, Pest, and Vegetation Control Plan, to avoid vehicle-related mortality of carrion-eaters. If pesticides/herbicides are to be used on the site, an Animal, Pest, and Vegetation Control Plan shall be developed to ensure that applications will be conducted within the framework of designated lead agencies and will entail the use of only EPA-registered pesticides/herbicides that are nonpersistent and immobile and approved by the designated lead agency.
Paleontological Resource Management Plan (Solar & IM 2009-043)	If paleontological resources are present at the site or if areas with a high potential to contain paleontological material have been identified, a Paleontological Resources Management Plan shall be developed. This shall include a mitigation plan; mitigation may include avoidance, removal of fossils (data recovery), stabilization, monitoring, protective barriers and signs, or other physical or administrative protection measures. The Paleontological Resources Management Plan also shall identify measures to prevent potential looting, vandalism, or erosion impacts and address the education of workers and the public to make them aware of the consequences of unauthorized collection of fossils on public land.
Spill Prevention & Emergency Response Plan (Solar & IM 2009-043)	As part of a Spill Prevention and Emergency Response Plan, measures to prevent potential groundwater and surface water contamination shall be identified. As part of a Spill Prevention and Emergency Response Plan identify sources, locations, and quantities of potential chemical releases (through spills, leaks, or fires) and to

Table B-2 *(continued)*
Required Plans

	define response measures and notification requirements shall be developed and followed to reduce potential for soil contamination. The plan shall also identify individuals and their responsibilities for implementing the plan. Shall be developed that considers sensitive ecological resources. Spills of any toxic substances shall be promptly addressed and cleaned up before they can enter aquatic or other sensitive habitats due to runoff or leaching. A comprehensive Spill Prevention and Emergency Response Plan shall be developed for the facility that meets the following criteria: is written, periodically updated, and made available to the entire workforce; contains procedures for timely notification of appropriate authorities, including the designated BLM land manager; provides spill/emergency contingency planning for each type of hazardous material present, including abatement or stabilizing of release, recovery of spilled product, and remediation of impacted environmental media; is supported by the strategic deployment of appropriate spill response materials and equipment, including PPE for individuals with spill or emergency response assignments; provides for prompt response to spills and timely delivery of recovered spill materials and contaminated environmental media to appropriately permitted off-site treatment or disposal facilities; formally assigns spill and emergency response duties to specified individuals; provides and documents appropriate training to individuals with spill or emergency response assignments; provides for the prompt response to spills and timely delivery of recovered spill materials and contaminated environmental media to appropriately permitted off-site treatment or disposal facilities; provides general awareness training to remaining facility personnel; and provides for written documentation of each event, including root cause analysis, corrective actions taken, and a characterization of the resulting environmental or health and safety impacts.
Stormwater Management Plan (Solar & IM 2009-043)	A Stormwater Management Plan shall be developed for the site to ensure compliance with applicable regulations and prevent off-site migration of contaminated stormwater, changes in pre-project storm hydrographs, or increased soil erosion. • Siting in identified 100-yr floodplains shall not be allowed within the development. • Projects developers shall maintain the pre-development flood hydrograph for all storms up to and including the 100-yr rainfall event. All stormwater retention and/or infiltration and treatment systems shall also be designed for all storms up to and including the 100-yr storm event.
Traffic Management Plan (Solar & IM 2009-043)	A traffic management plan shall be prepared for the site access roads to ensure that no hazards would result from increased truck traffic and that traffic flow would not be adversely impacted. This plan shall incorporate measures such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configuration. A Traffic Management Plan shall be prepared for the site access roads to control hazards that could result from increased truck traffic (most likely during construction or decommissioning), to ensure that traffic flow would not be adversely affected and that specific issues of concern (e.g., the locations of school bus routes and stops) are identified and addressed. This plan shall incorporate measures such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configuration. The plan shall be developed in coordination with local planning authorities. Transportation Plan (IM 2009-043) A transportation plan shall be developed, particularly for the transport of turbine components, main assembly cranes, and other large pieces of equipment. The plan shall consider specific object sizes, weights, origin, destination, and unique handling

Table B-2 *(continued)*
Required Plans

	requirements and shall evaluate alternative transportation approaches. In addition, the process to be used to comply with unique state requirements and to obtain all necessary permits shall be clearly identified. Operators shall consult with local planning authorities regarding increased traffic during the construction phase, including an assessment of the number of vehicles per day, their size, and type. Specific issues of concern (e.g., location of school bus routes and stops) shall be identified and addressed in the traffic management plan.
Trash Abatement Plan	A Trash Abatement Plan shall be developed that focuses on containing trash and food in closed containers and removing them periodically to reduce their attractiveness to opportunistic species, such as common ravens, coyotes, and feral dogs that could serve as predators on native wildlife and special status animals.
Water Resources Monitoring & Mitigation Plan	Project developers who plan to use groundwater shall develop and implement a groundwater Water Resources Monitoring and Mitigation Plan, which includes • Monitoring the effects of groundwater withdrawal for project uses, vegetation restoration and dust control uses during decommissioning, and aquifer recovery after project decommissioning. • Monitoring changes in flows, volumes, and water quality during construction and operations, as well as their recovery during decommissioning. • Monitoring frequency shall be decided on a site-specific basis and in coordination with federal, state, and local agencies managing surface water resources of the region. • Groundwater- and/or surface water-monitoring activities shall be as outlined in the established groundwater monitoring plan for the site. A Water Resources Monitoring and Mitigation Plan shall be developed for each project. Changes in surface water or groundwater quality (e.g., chemical contamination, increased salinity, increased temperature, decreased dissolved oxygen, and increased sediment loads) or flow that result in alteration of terrestrial plant communities or communities in wetlands, springs, seeps, intermittent streams, perennial streams, and riparian areas (including alterations of cover and community structure, species composition, and diversity) off the project site shall be avoided to the extent practicable. A monitoring plan shall be developed that determines the effects of groundwater withdrawals on plant communities. See measures applicable to protecting water quality.
Wind Erosion Management Plan	A wind erosion management plan should be prepared for projects located in a documented high wind area. The plan shall ensure protection of water quality, air quality and soil resources on the project site. The plan would develop mitigation measures that prevent excessive and unnatural soil deposition and erosion.
Worker Environmental Awareness Program	Develop a project-specific worker environmental awareness program (WEAP) that meets the approval of the issuing BLM office and would be carried out during all phases of the project (site mobilization, ground disturbance, grading, construction, operation, closure/decommissioning, or project abandonment, and restoration/reclamation activities). Identify in the WEAP biological resources and BMPs for minimizing impacts to resources. Provide interpretation for non-English speaking workers, and provide the same instruction for new workers prior to their working onsite. Keep in project field construction office files the names of onsite personnel (for example, surveyors, construction engineers, employees, contractors, contractor's employees, subcontractors) who have participated in the education program. At a minimum, include the following in the program: • Photos and habitat descriptions for special status species that may occur on the

Table B-2 *(continued)*
Required Plans

	project site and information on their distribution, general behavior, and ecology. • Species sensitivity to human activities. • Legal protections afforded the species. • Project BMPs for protecting species. • State and federal law violation penalties. • Worker responsibilities for trash disposal and safe/ humane treatment of special status species found on the project site, associated reporting requirements, and specific required measures to prevent taking of threatened or endangered species. • Handout materials summarizing the contractual obligations and protective requirements specified in project permits and approvals. • Project site speed limit requirements and penalties.
Health and Safety Program	A health and safety program shall be developed to protect workers during site characterization, construction, operation, and decommissioning of a renewable energy project. The program shall identify all applicable federal and state occupational safety standards and establish safe work practices addressing all hazards, including requirements for developing the following plans: general injury prevention; PPE requirements and training; respiratory protection; hearing conservation; electrical safety; hazardous materials safety and communication; housekeeping and material handling; confined space entry; hand and portable power tool use; gas-filled equipment use; and rescue response and emergency medical support, including on-site first-aid capability. In addition, the health and safety program shall address OSHA standard practices for the safe use of explosives and blasting agents (e.g., if used to construct foundations for power tower facilities); measures for reducing occupational EMF exposures; the establishment of fire safety evacuation procedures; and required safety performance standards (e.g., electrical system standards and lighting protection standards). The program shall include training requirements for applicable tasks for workers and establish procedures for providing required training to all workers. Documentation of training and a mechanism for reporting serious accidents to appropriate agencies shall be established.
Noise Monitoring & Mitigation Plan	Prepare a noise monitoring and mitigation plan. Design the project to: minimize noise impacts to sensitive noise receptors, limit increases to less than a five to 10 dBA increase above ambient levels, and not exceed local noise standards. Address project generated noise impacts as much as possible. Consider acquiring lands to serve as buffers around the proposed facilities.
Bat & Avian Protection Plan	Protect bats and migratory birds while improving conservation, safety, and reliability for utility customers. Projects will be analyzed on a case-by-case basis to determine whether development of an avian protection plan (APP) and/or avian bat protection plan (ABPP) is necessary.
Facility Vector (such as mosquitoes or rodents) Control Plan	A FVCP that meets the permitting agency approval and would be implemented during all phases of the project.
Hazardous Materials and Waste Management Plan	Shall address the selection, transport, storage, and use of all hazardous materials needed for construction, operation, and decommissioning of the facility for local emergency response and public safety authorities and for the regulating agency, and shall address the characterization, on-site storage, recycling, and disposal of all resulting wastes. The plan shall, at a minimum, include the following: facility identification; comprehensive hazardous materials inventory; Material Safety Data

Table B-2 *(continued)*
Required Plans

	Sheets (MSDS) for each type of hazardous material; emergency contacts and mutual aid agreements, if any; site map showing all hazardous materials and waste storage and use locations; copies of spill and emergency response plans and hazardous materials-related elements of a decommissioning/closure plan.
Construction and Operation Waste Management Plan	Shall identify the waste streams that are expected to be generated at the site and addresses hazardous waste determination procedures, waste storage locations, waste-specific management and disposal requirements, inspection procedures, and waste minimization procedures. The plan shall address all solid and liquid wastes that may be generated at the site in compliance with the CWA requirements to obtain the project's NPDES permit.

Table B-3
Required Studies

Transmission interconnection study	In applications to appropriate lead agencies, provide a copy of the electric transmission interconnection study from the appropriate control agency. Include in the interconnection study an identification of the transmission impacts beyond the first point of interconnection and acceptable measures to mitigate/alleviate impacts to the transmission network system. When more than one alternative mitigation measure is identified, indicate in the applications the measure selected by the project developer. Provide for each selected mitigation measure, an environmental analysis sufficient to meet the CEQA requirements for indirect project impacts.
Preliminary hydrologic study	Project developers shall conduct a preliminary hydrologic study demonstrating a clear understanding of the local surface water and groundwater hydrology. At a minimum this hydrologic study shall include: • The relationship of the project site hydrologic basin to the basins in the region • Identification of all surface water bodies (including rivers, streams, ephemeral washes/drainages, lakes, wetlands, playas and floodplains) • Identification of all applicable groundwater aquifers • Preliminary estimates of physical characteristics of surface water features, groundwater aquifers, and the regional climate (seasonal and long term).
Detailed hydrologic study	Developers shall be required to conduct a detailed hydrologic study demonstrating a clear understanding of the local surface water and groundwater hydrology. At a minimum this hydrologic study shall include: • Quantification of physical characteristics describing surface water features, such as streamflow rates, stream cross-sections, channel routings, seasonal flow rates (intermittent streams), peak flow rates (ephemeral washes/drainages), sediment characteristics and transport rates, lake depths, and surface areas of lakes, wetlands, and floodplains • Hydrologic analysis and modeling to define the 100-yr, 24-hour rainfall event for the project area and calculation of projected runoff from this storm at site; • Hydrologic analysis and modeling to identify 100-yr floodplain boundaries of any surface water feature on the site; • Quantification of physical characteristics describing the groundwater aquifer, such as physical dimensions of the aquifer, sediment characteristics, confined/unconfined conditions, hydraulic conductivity and transmissivity distribution of the aquifer, groundwater surface elevations, and groundwater flow processes (direction, recharge/discharge, current basin extractions, and surface water-groundwater connectivity); • Quantification of regional climate including seasonal and long-term information on temperatures, precipitation, evaporation, and evapotranspiration; and • Quantification of the sustainable yield of surface waters and groundwater available to the project. Project developers shall evaluate the water sources in terms of existing water rights and management plans for adequacy to serve project demands while maintaining aquatic, riparian, and other water-dependent resources.
Comprehensive groundwater basin analysis	If groundwater use is proposed, project developers shall ensure that a comprehensive analysis of the groundwater basin is provided and that the following potential significant impacts are evaluated: • Creation or exacerbation of overdraft conditions and their potential to cause subsidence and loss of aquifer storage capacity

Table B-3 *(continued)*
Required Studies

	• Use that cause injury to other water rights claims in the basin • Estimates of the total cone of depression considering cumulative drawdown from all potential pumping in the basin, including the project, for the life of the project through the decommissioning phase. • Changes in water quality that affect other beneficial use; and • Effects on groundwater dependent ecosystems such as springs, seeps, and wetlands that provide water for plants and animals.
Geomorphology Technical Report	Retain the services of a geoarchaeologist, when appropriate, to investigate and complete a geomorphology technical report. Include the following elements: • Reconstruct the historical geomorphology of the project's Area of Potential Effects (APE); • Map and date the sediments of the landforms in that area; • Assess whether buried archaeological deposits may be present and subject to project impacts.
Safety Assessment	A safety assessment shall be conducted to describe potential safety issues and the means that would be taken to mitigate them, including issues such as site access; construction; safe work practices; glare exposure from mirrors, heliostats, and/or power towers; security; heavy equipment transportation; traffic management; emergency procedures; and fire control.
Health Risk Assessment	A health risk assessment shall evaluate potential cancer and noncancer risks to workers and the general public from exposure to facility emission sources during construction and operations. If potential risks are found to exceed applicable threshold levels, measures shall be taken to decrease emissions from the source.

Table B-4
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
Air Quality				
1	Solar/Wind	Emissions	On-site vehicle use shall be reduced to the extent feasible.	C, O, D
2	Solar/Wind	Emissions	Idling of diesel equipment shall be limited to no more than 10 minutes unless idling must be maintained for proper operation (e.g., drilling, hoisting, and trenching).	C, O, D
3	Solar/Wind	Emissions	Consider using electric vehicles, biodiesel, or alternative fuels during construction and operation phases to reduce the project's criteria and GHG pollutant emissions.	C, O, D
4	Solar/Wind	Fugitive dust	Workers shall be trained to comply with the speed limit, use good engineering practices, minimize drop height of materials, and minimize disturbed areas.	C, O, D
5	Solar/Wind	Fugitive dust	Construction shall be staged to limit the exposed area at any time, whenever practical.	C, O, D
6	Solar/Wind	Fugitive dust	Access to the construction site and staging areas shall be limited to authorized vehicles only through the designated treated roads.	C, O, D
7	Solar/Wind	Fugitive dust	Access roads, on-site roads, and parking lots shall be surfaced with aggregate with hardness sufficient to prevent vehicles from crushing the aggregate and thus causing dust or compacted soil conditions. Paving could also be used on access roads and parking lots. Alternatively, chemical dust suppressants or durable polymeric soil stabilizers shall be used on these locations.	C, O, D
8	Solar/Wind	Fugitive dust	All unpaved roads, disturbed areas (e.g., areas of scraping, excavation, backfilling, grading, and compacting), and loose materials generated during project activities shall be watered as frequently as necessary to minimize fugitive dust generation. In water-deprived locations, water spraying shall be limited to active disturbance areas only and non-water-based dust control measures shall be implemented in areas with intermittent or non-heavy use, such as stockpiles or access roads.	C, O, D
9	Solar/Wind	Fugitive dust	Speed limits (e.g., 10 mph [16 km/h]) within the construction site shall be posted with visible signs and enforced to minimize airborne fugitive dust.	C, D
10	Solar/Wind	Fugitive dust	All vehicles transporting loose materials traveling on public roads shall be covered, and loads shall be sufficiently wet and kept below the freeboard of the truck.	C, O, D
11	Solar/Wind	Fugitive dust	Tires of all construction-related vehicles shall be inspected and cleaned as necessary to be free of dirt prior to entering paved public roadways.	C, D
12	Solar/Wind	Fugitive dust	Visible trackout or runoff dirt on public roadways from the construction site shall be cleaned (e.g., through street vacuum sweeping).	C, D

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
13	Solar/Wind	Fugitive dust	Topsoil from all excavations and construction activities shall be salvaged and reapplied during reclamation or, where feasible, used for interim reclamation by being reapplied to construction areas not needed for facility operation as soon as activities in that area have ceased.	C, O, D
14	Solar/Wind	Fugitive dust	Use wind erosion control techniques (such as windbreaks, water, chemical dust suppressants, and/or vegetation) where soils are disturbed in construction, access and maintenance routes, and materials stock pile areas. Keep related windbreaks in place until the soil is stabilized or permanently covered with vegetation. Wind fences shall be installed around disturbed areas that could affect the area beyond the site boundaries (e.g., nearby residences).	C, O, D
15	Solar/Wind	Fugitive dust	All soil disturbance activities shall be minimized and travel on unpaved roads shall be conducted during periods of low winds and stable conditions typical of early morning hours from late fall to early spring, to the extent practicable, which could significantly lower potential impacts on ambient air quality.	C, O, D
16	Solar/Wind	Fugitive dust	Any stockpiles created shall be kept on-site, with an upslope barrier in place to divert runoff. Stockpiles shall be sprayed with water, covered with tarpaulins, and/or treated with appropriate dust suppressants, especially in preparation for high wind or storm conditions. Compatible native vegetative plantings may also be used to limit dust generation for stockpiles that will be inactive for a relatively long period. Chemical dust suppressants that emit VOCs shall be avoided within or near O3 nonattainment areas.	C
17	Solar/Wind	Fugitive dust	Potential environmental impacts from the use of dust palliatives shall be minimized by taking all necessary measures to keep the chemicals out of sensitive soil and streams. In addition, the application of dust palliatives shall comply with federal, state, and local laws and regulations. Dust palliatives must meet the requirements of the applicable transmission system operator (e.g., Western Area Power Administration construction standards prohibit use of oil as a dust suppressant [Western 2008]).	C, O, D
Ecological				
18	Solar/Wind	Staging areas	As practical, staging and parking areas shall be located within the site of the utility-scale renewable energy facility to minimize habitat disturbance in areas adjacent to the site.	C, O, D
19	Solar/Wind	Construction activities	Before beginning construction, delineate the boundaries of areas to be disturbed using temporary construction fencing and/or flagging, and confine disturbances, project vehicles, and equipment to the delineated project areas.	C, D
20	Solar/Wind	Construction	To the extent practicable, work personnel shall stay within the ROW and/or easements.	C, O, D

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
21	Solar/Wind	Fugitive dust	If the application of water is needed to abate dust in construction areas and on dirt roads, use the least amount needed to meet safety and air quality standards and prevent the formation of puddles, which could attract wildlife to construction sites.	C, D
22	Solar/Wind	Traffic	Existing access roads, utility corridors, and other infrastructure shall be used to the maximum extent feasible.	C, O, D
23	Solar/Wind	Traffic	Plant species that would attract wildlife shall not be planted along high speed or high-traffic roads. If applicable, an avian and bat protection plan will be developed.	C, O, D
24	Solar/Wind	Traffic	Road closures shall be considered during crucial periods (e.g., extreme winter conditions, calving/fawning seasons). Personnel shall be advised to minimize stopping and exiting their vehicles in the winter ranges of large game while there is snow on the ground.	C, O, D
25	Solar/Wind	Helicopter use	The minimization of habitat disturbance shall be considered through utilizing helicopters for construction to minimize the need for access roads, and by locating transmission facilities in previously disturbed areas. Existing utility corridors and other support structures shall be utilized to the maximum extent feasible.	C, O, D
26	Solar/Wind	Noise	Noise reduction devices (e.g., mufflers) shall be employed to minimize the impacts on wildlife and special status species populations. Explosives shall be used only within specified times and at specified distances from sensitive wildlife or surface waters as established by the designated lead agency or other federal and state agencies. Operators shall ensure that all equipment is adequately muffled and maintained in order to minimize disturbance to wildlife	C, O, D
27	Solar/Wind	Noise	Minimize construction and operation related noise levels to minimize impacts to wildlife.	C, O, D
28	Solar/Wind	Power lines	Place low and medium voltage connecting power lines underground whenever possible. In certain circumstances, burial of the lines may be prohibitively expensive (for example in shallow bedrock areas) or may cause unacceptable impacts to wetland habitats and dependent species. Overhead lines may be acceptable: • if sited away from high bird crossing locations, such as between roosting and feeding areas or between lakes, rivers, and nesting areas; and/or • when the structures parallel tree lines or are otherwise screened so that collision risk is reduced.	S, C
29	Solar/Wind	Aquatic habitat	The placement of transmission towers within aquatic and wetland habitats shall be avoided whenever feasible. If towers must be placed within these habitats, they shall not impede flows or fish passage.	S, C, O

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
30	Solar/Wind	Aquatic habitat	Low-water crossings (fords) shall be used only as a last resort and then during the driest time of the year. Rocked approaches to fords shall be used. The pre-existing stream channel, including bed and banks, shall be restored after the need for a low-water ford has passed.	C, O, D
31	Solar/Wind	Habitat	To reduce the extent of habitat disturbance during construction and operation, existing access roads, utility corridors, and other infrastructure shall be used to the maximum extent feasible and foot and vehicle traffic through undisturbed areas shall be minimized.	C, O, D
32	Solar/Wind	Habitat	Areas left in a natural condition during construction (e.g., wildlife crossings) shall be maintained in as natural a condition as possible within safety and operational constraints.	C, O, D
33	Solar/Wind	Habitat	Projects shall be planned to avoid, minimize, or mitigate impacts on aquatic habitats, wetland habitats, waters of the United States, other special aquatic sties, unique biological communities, crucial wildlife habitats, breeding areas, and special status species locations and habitats, including designated critical habitat. Project planning shall be coordinated with the appropriate federal and state resource management agencies.	S
34	Solar/Wind	Habitat	Habitat loss, habitat fragmentation, and resulting edge habitat due to project development shall be minimized to the extent practicable. Habitat fragmentation could be reduced by consolidating facilities (e.g., access roads and utilities could share common ROWs, where feasible), reducing the number of access roads to the minimum amount required, minimizing the number of stream crossings within a particular stream or watershed, and, locating facilities in areas where habitat disturbance has already occurred. Individual project facilities shall be located and designed to minimize disruption of animal movement patterns and connectivity of habitats.	S
35	Solar/Wind	Habitat	The number of areas where wildlife could hide or be trapped (e.g., open sheds, pits, uncovered basins, and laydown areas) shall be minimized. All pits shall contain wildlife escape ramps. For example, an uncovered pipe that has been placed in a trench shall be capped at the end of each workday to prevent animals from entering the pipe. If a special status species is discovered inside a component, that component must not be moved or, if necessary, moved only to remove the animal from the path of activity, until the animal has escaped.	C, O, D
36	Wind	Birds	Locating renewable energy power facilities near open water or other areas known to attract a large number of birds shall be avoided.	S
37	Solar/Wind	Birds/bats	Tall structures shall be located to avoid known flight paths of birds and bats.	S
38	Solar/Wind	Birds/ raptors	Project proponents should establish buffer zones and protection, mitigation, and monitoring plans for active nests detected during surveys.	S, C
39	Solar/Wind	Birds	Although it is unclear whether tubular or lattice towers pose less risk, it is recommended that tubular towers or best available technology be used to reduce bird perching opportunities on turbines.	S, C, O

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
40	Wind	Raptors	Turbines shall be configured to avoid landscape features known to attract raptors if site studies show that placing turbines there would pose a significant risk to raptors.	S
41	Solar/Wind	Special status species	In consultation with permitting agencies, avoid special status species or unique plant assemblages when installing and maintaining transmission line towers/poles, access roads, pulling sites, and storage and parking areas adjacent to linear facilities.	S, C, O
42	Solar/Wind	Special status species	During all project phases, buffer zones shall be established around sensitive habitats, and project facilities and activities shall be excluded or modified within those areas, to the extent practicable.	C, O, D
43	Solar/Wind	Special status species	Project activities shall not be located in or near occupied habitats of special status animal species. Buffer zones shall be established around these areas (e.g., identified in the land use plan or substantiated by best available information or science), to prevent any destructive impacts associated with project activities.	S
44	Solar/Wind	Special status habitat	Prior to any ground-disturbing activity, seasonally appropriate walkthroughs shall be conducted by a qualified biologist or team of biologists to ensure that important or sensitive species or habitats are not present in or near project areas. Attendees at the walkthrough shall include appropriate federal agency representatives, state natural resource agencies, and construction contractors, as appropriate. Habitats or locations to be avoided (with appropriately sized buffers) shall be clearly marked.	C, O, D
45	Solar/Wind	Vegetation	Project-specific vegetation management plans shall investigate possibilities of revegetating parts of the renewable energy project area. Where revegetation is accomplished, fire breaks are required, such that vegetated areas would not result in increased fire hazard.	S, C, D
46	Solar/Wind	Wetlands	Where a pipeline trench may drain a wetland, trench breakers shall be constructed and/or the trench bottom shall be sealed to maintain the original wetland hydrology.	C, O, D
47	Solar/Wind	Noxious weeds	The establishment and spread of invasive species and noxious weeds within the ROW and in associated areas of ground surface disturbance or vegetation cutting shall be prevented. The area shall be monitored regularly and invasive species should be eradicated immediately.	C, O, D
48	Solar/Wind	Herbicide use	Herbicide use shall be limited to nonpersistent, immobile substances. Only herbicides with low toxicity to wildlife and nontarget native plant species shall be used, as determined in consultation with the USFWS. The typical herbicide application rate shall be used rather than the maximum application rate, where effective. All herbicides shall be applied in a manner consistent with their label requirements and in accordance with guidance provided in the Final PEIS on vegetation treatments using herbicides (BLM 2007). No herbicides shall be used near or in surface water, streams (including ephemeral, intermittent, or perennial), riparian areas, or wetlands. Setback distances shall be determined through coordination with federal and state resource management	C, O, D

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
			agencies. Before herbicide treatments are begun, the designated lead agency or an authorized contractor shall conduct nest searches in and around treatment areas to minimize impacts on migratory birds.	
49	Solar/Wind	Waste	Construction debris, especially treated wood, shall not be stored or disposed of in areas where it could come in contact with aquatic habitats.	C, O, D
50	Solar/Wind	Reclamation	Access roads shall be reclaimed when they are no longer needed. However, seasonal restrictions (e.g., nest and brood rearing) shall be considered, as appropriate (e.g., identified in the land use plan or substantiated by best available information or science).	C, O, D
51	Solar/Wind	Reclamation	All holes and ruts created by removal of structures and access roads shall be filled or graded.	D
52	Solar/Wind	Reclamation	While structures are being dismantled, care shall be taken to avoid leaving debris on the ground in areas in which wildlife regularly move.	D
53	Solar/Wind	Reclamation	The facility fence shall remain in place for several years to help reclamation (e.g., would preclude large mammals and vehicles from disturbing revegetation efforts).	D
54	Solar/Wind	Reclamation	For a repowering or retrofit project, remove and stabilize roads and facilities that are no longer needed; re-seed with native plants appropriate for the soil conditions and adjacent habitat. Derive plants from local seed sources where feasible. The term "local" in this context means seed sources with a genetic makeup that do not vary substantially from seeds or plants found at the disturbed location.	C
55	Solar/Wind	Biological monitor	Vehicles and site workers shall avoid entering aquatic habitats such as streams and springs during site characterization activities until surveys by qualified biologists have evaluated the potential for unique flora and fauna to be present.	C, O, D
Hazardous Materials				
56	Solar/Wind	Training	Ensure that on-site workers are fully trained to properly handle and are informed about each of the hazardous materials to be used on-site.	C, O, D
57	Solar/Wind	Hazardous materials	Pollution prevention opportunities shall be identified and implemented, including material substitution of less hazardous alternatives, recycling, and waste minimization.	C, O, D
58	Solar/Wind	Hazardous materials	Written procedures for the storage, use, and transportation of each type of hazardous material present shall be provided, including all vehicle and equipment fuels.	S, C, O, D
59	Solar/Wind	Hazardous materials	Authorized users for each type of hazardous material shall be identified.	C, O, D

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
60	Solar/Wind	Hazardous materials	Hazardous materials and waste storage areas or facilities shall be formally designated and access restricted to authorized personnel. Construction debris, especially treated wood, shall not be disposed of or stored in areas where it could come in contact with aquatic habitats.	S, C, O, D
61	Solar/Wind	Hazardous materials	Hazardous materials and waste storage areas must be consistent with accepted industry practices as well as applicable federal, state, and local regulations and that include, at a minimum, containers constructed of compatible materials, properly labeled, and in good condition; secondary containment features for liquid hazardous materials and wastes; physical separation of incompatible chemicals; and fire-fighting capabilities when warranted.	C, O, D
62	Solar/Wind	Hazardous materials	Procedures shall be established for fuel storage and dispensing, including shutting off vehicle (equipment) engines; using only authorized hoses, pumps, and other equipment in good working order; maintaining appropriate fire and spill response materials at equipment-fueling stations; providing emergency shutoffs for fuel pumps; ensuring that fueling stations are paved; ensuring that both aboveground fuel tanks and fueling areas have adequate secondary containment; prohibiting smoking, welding, or open flames in fuel storage and dispensing areas; equipping the area with fire suppression devices, as appropriate; conducting routine inspections of fuel storage and dispensing areas; requiring prompt recovery and remediation of all spills, and providing for the prompt removal of all fuel and fuel tanks used to support construction vehicles and equipment at the completion of facility construction and decommissioning phases.	S, C, O, D
63	Solar/Wind	Hazardous materials	Good waste management practices shall be adopted for handling, storing, and disposing of wastes generated by a construction project to prevent the release of waste materials into stormwater discharges; waste management includes the following: spill prevention and control, construction debris and litter management, concrete waste management, and liquid waste management.	C, O, D
64	Solar/Wind	Hazardous materials storage	To the greatest extent practical and considering the remoteness of a given facility, "just-in-time" ordering procedures shall be employed that are designed to limit the amounts of hazardous materials present on the site to quantities minimally necessary to support continued operations; excess hazardous materials shall receive prompt disposition.	C, O, D
65	Solar/Wind	Herbicide/ pesticide use	Avoid rinsing herbicide/pesticide spray tanks in or near water bodies.	C, O, D
66	Solar/Wind	Spills	Berms and other controls shall be used at facilities to prevent off-site migration of any leaked or spilled HTF, TES fluids, or any other chemicals stored or used at the site.	C, O, D
67	Solar/Wind	Spills	Remediate hazardous product leaks and chemical releases that constitute a Recognized Environmental Condition before completing decommissioning.	D

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
68	Solar/Wind	Transporting hazardous materials	Dedicated areas with secondary containment shall be established for off-loading hazardous materials transport vehicles.	C, O, D
69	Solar/Wind	Refueling	Refueling areas shall be located away from surface water locations and drainages and on paved surfaces; features shall be added to direct spilled materials to sumps or safe storage areas where they can be subsequently recovered.	S, C, O, D
70	Solar/Wind	Vehicles	All vehicles and equipment shall be in proper working condition to ensure that there is no potential for leaks of motor oil, antifreeze, hydraulic fluid, grease, or other hazardous materials.	C, O, D
71	Solar/Wind	Inspections	Written procedures shall be established for inspecting hazardous materials and waste storage areas and for plant systems containing hazardous materials; identified deficiencies and their resolution shall be documented.	S, C, O, D
72	Solar/Wind	Waste removal	Schedules shall be established for the regular removal of wastes (including sanitary wastewater generated in temporary, portable sanitary facilities) for delivery by licensed haulers to appropriate off-site treatment or disposal facilities.	C, O, D
73	Solar/Wind	Decommissioning	During facility decommissioning, the following shall occur: emergency response capabilities shall be maintained throughout the decommissioning period as long as hazardous materials and wastes remain on-site, and emergency response planning shall be extended to any temporary material and equipment storage areas that may have been established; temporary waste storage areas shall be properly designated, designed, and equipped; hazardous materials removed from systems shall be properly containerized and characterized, and recycling options shall be identified and pursued; off-site transportation of recovered hazardous materials and wastes resulting from decommissioning activities shall be conducted by authorized carriers; all hazardous materials and waste shall be removed from on-site storage and management areas (including surface impoundments), and the areas shall be surveyed for contamination and remediated as necessary.	D
Health and Safety				
74	Solar/Wind	Health	A health risk assessment shall evaluate potential cancer and noncancer risks to workers from exposure to facility emission sources during construction and operations. If potential risks are found to exceed applicable threshold levels, measures shall be taken to decrease emissions from the source.	S, C, O, D
75	Solar/Wind	Safety	A safety assessment shall be conducted to describe potential safety issues and the means that would be taken to mitigate them, including issues such as site access; construction; safe work practices; glare exposure from mirrors, heliostats, and/or power towers; security; heavy equipment transportation; traffic management; emergency procedures; and fire control.	S, C, O, D

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
76	Solar/Wind	EMF	Measures shall be considered to reduce occupational EMF exposures, such as backing electrical generators with iron to block EMF, shutting down generators when working in the vicinity, and otherwise limiting exposure time and proximity while generators are running.	S
77	Solar/Wind	Traffic	Operators shall consult with local planning authorities regarding increased traffic during the construction phase, including an assessment of the number of vehicles per day, their size, and type. Specific issues of concern (e.g., location of school bus routes and stops) shall be identified and addressed in the traffic management plan.	O
78	Solar/Wind	Firearms	Prohibit workers or visitors, with the exception of law enforcement personnel, from bringing firearms or weapons to the project site.	C, O, D
79	Solar/Wind	Wastewater	Any wastewater generated in association with temporary, portable sanitary facilities shall be periodically removed by a licensed hauler and introduced into an existing municipal sewage treatment facility. Portable sanitary facilities provided for construction crews shall be adequate to support expected on-site personnel.	C, O, D
Lands and Realty				
80	Solar/Wind	Land use	To plan for efficient use of the land, necessary infrastructure requirements shall be consolidated wherever possible, and current transmission and market access shall be evaluated carefully.	S
81	Solar/Wind	Overhead lines	All electrical collector lines shall be buried in a manner that minimizes additional surface disturbance (e.g., along roads or other paths of surface disturbance). Overhead lines may be used in cases where burial of lines would result in further habitat disturbance.	S
82	Solar/Wind	Monitoring	Site monitoring protocols defined in the POD shall be implemented. These will incorporate monitoring program observations and additional mitigation measures into standard operating procedures and BMPs to minimize future environmental impacts.	S, C
83	Solar/Wind	Monitoring	All control and mitigation measures established for the project in the POD and the resource-specific management plans that are part of the POD shall be maintained and implemented throughout the construction phase, as appropriate.	S, C
84	Solar/Wind	Monitoring	Results of monitoring program efforts shall be provided to the BLM authorized officer.	C, D
85	Solar/Wind	Decommissioning	All management plans, BMPs, and stipulations developed for the construction phase shall be applied to similar activities during the decommissioning phase.	D
Livestock Grazing				
86	Solar/Wind	Roads	Access roads shall be constructed, improved, and maintained to minimize impact on grazing operations. Road design would include appropriate fencing, cattle guards, and signs.	C, O

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
Minerals				
87	Solar/Wind	Mining	Transmission lines shall be located to avoid conflicts with mining activities in areas with active mineral development.	S
Native American Concerns				
88	Solar/Wind	Training	Prior to construction, consideration shall be given to training contractor personnel whose activities or responsibilities could affect resources of significance to Native Americans during construction. When there is a reasonable expectation of encountering unidentified cultural resources during construction, monitoring of construction shall be considered to minimize impacts on resources of significance to Tribes to the extent possible.	S, C, O, D
89	Solar/Wind	Visual	Visual intrusion on sacred areas and places of traditional importance shall be avoided to the extent practical through the selection of renewable energy facility location and technology. When avoidance is not possible, timely and meaningful consultation with the affected Tribe(s) shall be conducted to formulate a mutually acceptable plan to minimize or mitigate the adverse effect.	S
90	Solar/Wind	Noise	Standard noise mitigation measures shall be employed when near sacred sites to minimize the impacts of noise on culturally significant areas.	C, O, D
91	Solar/Wind	Health and safety	Health and safety mitigation measures for the general public shall be employed when renewable energy facilities are located near to Native American traditional use areas in order to minimize potential health and safety impacts to Native Americans.	C, O, D
92	Solar/Wind	Mitigation	All mitigation measures listed in cultural resources would also apply to historic properties of concern to Native Americans.	S, C, O, D
Noise - Vibration				
93	Solar/Wind	Construction	Siting of stationary construction equipment (e.g., compressors and generators) shall be far from nearby residences and other sensitive receptors.	C, O, D
94	Solar/Wind	Equipment	If noise from a transformer becomes an issue, a new transformer with reduced flux density, which generates noise levels as much as 10 to 20 dB lower than National Electrical Manufacturers Association (NEMA) standard values, could be installed. Alternatively, barrier walls, partial enclosures, or full enclosures could be adopted to shield or contain the transformer noise, depending on the degree of noise control needed.	O
95	Solar/Wind	Equipment	Permanent sound-generating facilities (e.g., compressors, pumps) shall be sited away from residences and other sensitive receptors. In areas of known conflicts, consideration shall be given to the installation of acoustic screening.	O

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
96	Solar/Wind	Equipment	Where feasible, low-noise systems (e.g., for ventilation systems, pumps, generators, compressors, and fans) shall be incorporated and equipment selected that has no prominent discrete tones.	C, O, D
97	Solar/Wind	Equipment	All equipment shall be maintained in good working order in accordance with manufacturers' specifications. For example, suitable mufflers and/or air-inlet silencers shall be installed on all internal combustion engines (ICEs) and certain compressor components.	C, O, D
98	Solar/Wind	Equipment	All equipment shall have sound-control devices no less effective than those provided on the original equipment. All construction equipment used shall be adequately muffled and maintained. Properly maintain mufflers, brakes, and loose items on construction and operation related vehicles to minimize noise and ensure safe operations. Operate trucks as quietly as possible, while considering local conditions. Advise about downshifting and vehicle operations in residential communities to keep truck noise to a minimum.	C, O, D
99	Solar/Wind	Equipment	Install mufflers on diesel and gas-driven engine air coolers and exhaust stacks. Equip emergency pressure relief valves and steam blow-down lines with silencers to limit noise levels.	C, O, D
100	Solar/Wind	Equipment	If residences or sensitive receptors are nearby, noisy equipment, such as turbines and motors, shall be placed in enclosures.	O
101	Solar	Equipment	If a wet-cooling tower is to be used, the louvered side shall be sited to face away from sensitive human receptors. The cooling tower shall be located such that nearby equipment can act as a barrier and serve as additional noise reduction. Quieter fans shall be selected in the facility design, and fans shall be operated at a lower speed, particularly if operating at night. If a high degree of reduction is required, silencers shall be used on the fan stacks.	S, O
102	Wind	Equipment	Use variable speed turbines or pitched blades to lower rotational speed.	S, O
103	Solar/Wind	Helicopter	Helicopter flights at low altitude (under 1,500 ft. [457 m]) near noise-sensitive receptors shall be minimized except at locations where only helicopter activities can perform the task.	C, O, D
104	Solar/Wind	Vehicles	Construction and decommissioning activities and construction traffic shall be scheduled to minimize disruption to nearby residents and existing operations surrounding the project areas.	C, O, D
105	Solar/Wind	Vehicles	All vehicles traveling within and around the project area shall be operated in accordance with posted speed limits to reduce vehicular noise levels.	C, O, D
106	Solar/Wind	Safety	Warning signs shall be posted in high-noise areas, and a hearing protection program shall be implemented for work areas with noise in excess of 85 dBA.	C, O, D

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
107	Solar/Wind	Timing	Whenever feasible, different noisy activities shall be scheduled to occur at the same time, since additional sources of noise generally do not increase noise levels at the site boundary by much. That is, less-frequent but noisy activities would generally be less annoying than lower level noise occurring more frequently.	C, O, D
108	Solar/Wind	Monitoring/ mitigation	Project developers shall realize that complaints about noise may still occur, even when the noise levels from the facility do not exceed regulatory levels. Accordingly, a noise complaint process and hotline for the surrounding communities shall be implemented, including documentation, investigation, evaluation, and resolution of all legitimate project-related noise complaints.	C, O, D
109	Solar/Wind	Monitoring/ mitigation	Noise reduction measures that shall be considered include siting noise sources to take advantage of topography and distance, and constructing engineered sound barriers and/or berms or sound-insulated buildings, if needed, to reduce potential noise impacts at the locations of nearby sensitive human receptors. As an alternative, the solar facility generating higher operational noises (e.g., a solar dish engine facility) could take advantage of higher background noises; for example, it could be sited within an existing noisy area, such as close to a well-traveled highway, where the ambient sounds partially mask the noise from the facility.	S, C, O, D
110	Solar/Wind	Monitoring/ mitigation	Noise control measures (e.g., erection of temporary wooden noise barriers) shall be implemented if noisy activities would be expected near sensitive receptors.	C, O, D
111	Solar/Wind	Monitoring/ mitigation	If noisy activities, such as blasting or pile driving, are required during the construction or decommissioning period, nearby residents shall be notified in advance.	C, O, D
112	Solar/Wind	Monitoring/ mitigation	Employ engineering controls, including sound-insulated equipment and control rooms, to reduce the average noise level to appropriate levels in normal work areas.	C, O, D
Recreation				
113	Solar/Wind	Siting	Renewable energy facilities shall not be placed in areas of unique or important recreation resources.	S
114	Solar/Wind	Access	Replacement of access lost for OHV use shall be considered as part of the analysis of project-specific impacts.	S
Soils				
115	Solar/Wind	Construction	Construction shall be conducted in stages to limit the areas of exposed soil at any given time. For example, only land that will be actively under construction in the near term (e.g., within the next 6 to 12 months) should be cleared of vegetation.	C, O, D
116	Solar/Wind	Construction	Ground-disturbing activities shall be minimized, especially during the rainy season.	C, O, D
117	Solar/Wind	Construction	Construction on wet soils shall be avoided.	C, O, D

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
118	Solar/Wind	Construction	Foundations and trenches shall be backfilled with originally excavated material as much as possible. Excess excavation materials shall be disposed of only in approved areas or, if suitable, stockpiled for use in reclamation activities.	C, O, D
119	Solar/Wind	Construction	Water or other stabilizing agents shall be used to wet roads in active construction areas and laydown areas to minimize the windblown erosion of soil.	C, O, D
120	Solar/Wind	Clearing	The clearing and disturbing of sensitive areas (e.g., steep slopes and natural drainages) and other areas shall be avoided outside the construction zone.	C, O, D
121	Solar/Wind	Disturbance area	The area disturbed by operation of a renewable energy project shall be minimized (e.g., by using existing roads).	C, O, D
122	Solar/Wind	Disturbance area	The footprint of disturbed areas, including the number and size/length of roads, fences, borrow areas, and laydown and staging areas, shall be minimized.	S, C, O, D
123	Solar/Wind	Disturbance area	Electrical lines from solar collectors and/or wind turbines shall be buried along existing features (e.g., roads or other paths of disturbance) to minimize the overall area of surface disturbance whenever possible.	C, O, D
124	Solar/Wind	Disturbance area	Temporary stabilization of disturbed areas that are not actively under construction shall occur.	C, O, D
125	Solar/Wind	Disturbance area	Permanent stabilization of disturbed areas shall occur during final grading and landscaping of the site.	C, O, D
126	Solar/Wind	Slopes/ grades	Excessive grades shall be avoided on roads, road embankments, ditches, and drainages, especially in areas with erodible soils.	S, C, O, D
127	Solar/Wind	Slopes/ grades	Areas with unstable slopes shall be avoided, and local factors that can cause slope instability (e.g., groundwater conditions, precipitation, earthquake activity, slope angles, and the dip angles of geologic strata) shall be identified.	S, C, O, D
128	Solar/Wind	Slopes/ grades	The creation of excessive slopes shall be avoided during site preparation and construction. Special construction techniques are to be used, where applicable, in areas of steep slopes, erodible soil, and drainage ways.	C, O, D
129	Solar/Wind	Drainages	Drainage crossings shall be stabilized as quickly as possible, and channel erosion shall be prevented from runoff caused by the project.	C, O, D
130	Solar/Wind	Stockpiles	Originally excavated materials shall be stockpiled and used for backfill.	C, O, D
131	Solar/Wind	Fill	Topsoil from all excavation and construction activities shall be salvaged so it can be reapplied to the disturbed area once construction is completed.	C, O, D

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
132	Solar/Wind	Fill	Borrow materials shall be obtained only from authorized and permitted sites; existing sites shall be used in preference to new sites.	C, O, D
133	Solar/Wind	Roads	Abandoned roads and roads no longer needed shall be recontoured and revegetated.	C, O, D
134	Solar/Wind	Erosion control	Potential soil erosion shall be controlled at culvert outlets with appropriate structures.	C, O, D
135	Solar/Wind	Erosion control	Catch basins, roadway ditches, and culverts shall be cleaned and maintained regularly.	C, O, D
136	Solar/Wind	Erosion control	Runoff from slope tops shall be controlled and directed to settling or rapid infiltration basins, and disturbed slopes shall be stabilized as quickly as possible.	C, O, D
137	Solar/Wind	Erosion control	Sediment-laden waters from disturbed, active areas within the project site shall be retained through the use of barriers and sedimentation devices (e.g., berms, straw bales, sandbags, jute netting, or silt fences).	C, O, D
138	Solar/Wind	Erosion control	Barriers and sedimentation devices shall be placed around drainages and wetlands to prevent contamination by sediment-laden water.	C, O, D
139	Solar/Wind	Erosion control	Sediment from barriers and sedimentation devices shall be removed to restore sediment control capacity	C, O, D
140	Solar/Wind	Erosion control	Routine site inspections shall be conducted to assess the effectiveness and maintenance requirements for erosion and sediment control systems.	C, O, D
141	Solar/Wind	Operation	All appropriate mitigation measures developed for the construction phase shall be applied to similar activities during the operations phase.	O
142	Solar/Wind	Revegetation	Project areas are to be replanted with vegetation at spaced intervals to the extent possible to break up areas of exposed soil and reduce soil loss by wind erosion.	C, O, D
143	Solar/Wind	Revegetation	Native plant communities in disturbed areas shall be restored by natural revegetation or by seeding and transplanting (using weed-free native grasses, forbs, and shrubs), based on BLM recommendations, as early as possible once construction is completed.	C, O, D
144	Solar/Wind	Reclamation	The original grade and drainage pattern shall be re-established.	C, O, D
145	Solar/Wind	Reclamation	All areas of disturbed soil shall be reclaimed using weed-free native grasses, forbs, and shrubs. Reclamation activities shall be undertaken as early as possible on disturbed areas.	C, O, D
146	Solar/Wind	Reclamation	All mitigation measures developed for the construction phase shall be applied to similar activities during the decommissioning/reclamation phase.	D
Transportation				
147	Solar/Wind	Transportation plans	The project shall be planned to utilize existing roads and utility corridors to the maximum extent feasible and to minimize the number and length/size of new roads, lay-down areas, and borrow areas.	S

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
148	Solar/Wind	Design	Access roads and on-site roads shall be surfaced with aggregate materials, wherever appropriate.	S, C, O, D
149	Solar/Wind	Design	Access roads shall be located to follow natural contours and minimize side hill cuts.	S, C, O, D
150	Solar/Wind	Design	Roads shall be located away from drainage bottoms and avoid wetlands, if practicable.	S, C, O, D
151	Solar/Wind	Design	Roads shall be designed so that changes to surface water runoff are avoided and erosion is not initiated.	S, C, O, D
152	Solar/Wind	Design	Access roads shall be located to minimize stream crossings. All structures crossing streams shall be located and constructed so that they do not decrease channel stability or increase water velocity. Operators shall obtain all applicable Federal and State permits.	S, C, O, D
153	Solar/Wind	Construction traffic	To mitigate impacts related to the daily commutes of construction workers, the operator may be required to implement local road improvements, provide multiple site access locations and routes, stagger work schedules, and implement a ride-sharing or shuttle program.	C, D
154	Solar/Wind	Oversize vehicles	Obtain vehicle oversize and overweight permits, as appropriate.	C, O, D
155	Solar/Wind	Traffic	Traffic shall be restricted to the roads developed for the project. Use of other unimproved roads shall be restricted to emergency situations.	C, O, D
156	Solar/Wind	Traffic	Signs shall be placed along construction roads to identify speed limits, travel restrictions, and other standard traffic control information. To minimize impacts on local commuters, consideration shall be given to limiting construction vehicles traveling on public roadways during the morning and late afternoon commute time. Consideration shall also be given to opportunities for busing of construction workers to the job site to reduce traffic volumes.	C, O, D
157	Solar/Wind	Operation	To reduce hazards for incoming and outgoing traffic, as well as to expedite traffic flow, the operator may be required to implement traffic control measures, such as intersection realignment coupled with speed limit reduction; the installation of traffic lights and/or other signage; and the addition of acceleration, deceleration, and turn lanes on routes with site entrances.	O
158	Solar/Wind	Monitoring	Ongoing ground transportation planning shall be conducted to evaluate road use, minimize traffic volume, and ensure that roads are maintained adequately to minimize associated impacts.	O
Visual Resources				
159	Solar/Wind	Design	Visual information shall be included as a part of the critical due diligence information when determining and selecting development sites and ROW boundaries.	S

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
160	Solar/Wind	Design	Consider proposed facility and transmission line visual impacts from relevant viewing angles when selecting building sites and locations. Consider visual impacts from frequent water vapor plumes if cooling towers are proposed.	S
161	Solar/Wind	Design	ROW location, size, and boundary determinations shall consider terrain characteristics and opportunities for full or partial project concealment.	S
162	Solar/Wind	Design	Other site design elements shall be integrated with the surrounding landscape. Elements to address include minimizing the profile of the ancillary structures, burial of cables, prohibition of commercial symbols, and lighting. Regarding lighting, efforts shall be made to minimize the need for and amount of lighting on ancillary structures.	S
163	Solar/Wind	Design	Siting shall take advantage of both topography and vegetation as screening devices to restrict views of projects from visually sensitive areas.	S
164	Solar/Wind	Design	Locating facilities near visually prominent landscape features (e.g., knobs and waterfalls) that naturally draw observers' attention shall be avoided.	S
165	Solar/Wind	Design	Use commercially available modeling software to identify a "zone" of flicker. Appropriately site and orient wind turbines to minimize shadow flicker occurrences on nearby residences.	S
166	Wind	Design	Maintain uniform size and design of turbines (for example, direction of rotation, type of turbine and tower, and height).	S
167	Solar/Wind	Design	Structures and roads shall be designed and located to minimize and balance cuts and fills. Retaining walls, binwalls, half bridges, and tunnels shall be used to reduce cut and fill.	S
168	Solar/Wind	Design	Low-profile structures shall be chosen whenever possible to reduce their visibility.	S
169	Solar/Wind	Design	Openings in vegetation for facilities, structures, roads, and the like shall mimic the size, shape, and characteristics of naturally occurring openings to the extent possible.	S, C
170	Solar/Wind	Design	Materials and surface treatments shall repeat and/or blend with the existing form, line, color, and texture of the landscape.	S, C
171	Solar/Wind	Design	Review pre-development visual conditions, inventoried visual quality and integrity shall be reviewed and the visual elements of form, line, color and texture restored to pre-development visual compatibility or to that of the surrounding landscape setting conditions, whichever achieves the greater visual quality and ecologically sound outcome.	S
172	Solar/Wind	Design	Horizontal and vertical pipeline bending shall be used in place of cut-and-fill activities where feasible.	S, C

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
173	Solar/Wind	Construction	All stakes and flagging will be removed from the construction area and disposed of in an approved facility.	C, O, D
174	Solar/Wind	Surface disturbance	Existing rocks, vegetation, and drainage patterns shall be preserved to the maximum extent possible.	C, O, D
175	Solar/Wind	Surface disturbance	Brush-beating or mowing, or using protective surface matting rather than vegetation removal shall be done where feasible.	C, O, D
176	Solar/Wind	Surface disturbance	Slash from vegetation removal shall be mulched and spread to cover fresh soil disturbances as part of the revegetation plan. Slash piles shall not be left in sensitive viewing areas.	C, O, D
177	Solar/Wind	Surface disturbance	Project developers shall reduce visual impacts during construction by clearly delineating construction boundaries and minimizing areas of surface disturbance; preserving vegetation to the greatest extent possible; utilizing undulating surface disturbance edges; stripping, salvaging, and replacing topsoil; contoured grading; controlling erosion; using dust suppression techniques; and restoring exposed soils to their original contour and vegetation.	C O, D
178	Solar/Wind	Surface disturbance	Visual impacts are lessened when vegetation and ground disturbances are minimized, siting shall take advantage of existing clearings to reduce vegetation clearing and ground disturbance. Linear development (transmission lines, pipelines, roads, etc.) shall follow the edges of clearings (where they would be less conspicuous) rather than passing through the center of clearings.	S, C, O, D
179	Solar/Wind	Surface disturbance	Road-cut slopes shall be rounded, and the cut-and-fill pitch shall be varied to reduce contrasts in form and line; the slope shall be varied to preserve specimen trees and nonhazardous rock outcroppings.	C, O, D
180	Solar/Wind	Surface disturbance	Topsoil from cut-and-fill activities shall be segregated and spread on freshly disturbed areas to reduce color contrast and aid rapid revegetation. Topsoil piles shall not be left in sensitive viewing areas.	C, O, D
181	Solar/Wind	Surface disturbance	Disposal of excess fill material downslope shall be avoided in order to avoid creating color contrast with existing vegetation and soils.	C, O, D
182	Solar/Wind	Surface disturbance	Excess cut-and-fill materials shall be hauled in or out to minimize ground disturbance and impacts from fill piles.	C, O, D
183	Solar/Wind	Surface disturbance	Soil disturbance shall be minimized in areas with highly contrasting subsoil color.	C, O, D

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
184	Solar/Wind	Surface treatments	Soil borrow areas, cut-and-fill slopes, berms, water bars, and other disturbed areas shall be contoured to approximate naturally occurring slopes, thereby avoiding form and line contrasts with the existing landscape. Contouring to a rough texture would trap seed and discourage off-road travel, thereby reducing associated visual impacts.	C, O, D
185	Solar/Wind	Surface treatments	Gravel and other surface treatments shall be removed or buried.	C, O, D
186	Solar/Wind	Facilities	Minimize the number of structures. Combine and carry out activities in one structure, or co-locate structures to share pads, fences, access roads, lighting, and other facilities.	S, O
187	Wind	Facilities	Turbine arrays and turbine design shall be integrated with the surrounding landscape. Design elements to be addressed include visual uniformity, use of tubular towers, proportion and color of turbines, nonreflective paints, and prohibition of commercial messages on turbines.	S
188	Solar/Wind	Skylining	Visual "skylining" shall be avoided when structures, transmission lines, and other structures are placed on ridgelines, summits, or other locations where they would be silhouetted against the sky from important viewing locations. Skylining draws visual attention to the project elements and can greatly increase visual contrast. Siting shall take advantage of opportunities to use topography as a backdrop for views of facilities and structures to avoid skylining. Evaluate alternatives and select the least visually intrusive option when linear facilities (e.g. transmission lines) cross over ridgelines.	S
189	Solar/Wind	Lighting	Minimize the need for and amount of lighting on ancillary structures. Design and commit to install permanent exterior lighting such that: • light fixtures do not cause spill light beyond the project site; b) lighting fixtures are fully shielded, do not cause reflected glare, and use low temperature bulbs; • direct lighting does not illuminate the nighttime sky; • illumination of the project and its immediate vicinity is minimized by including use of motion detectors or other lighting controls to turn lights off except when needed for security and safety; • lighting complies with local policies and ordinances; and • use lighting that meets International Dark Sky Association standards, when feasible.	S, C, O, D
190	Solar/Wind	Color	Paint the turbines with a non-reflective coating and a uniform color while observing air navigational marking regulations and addressing biological resource concerns.	S, C, O

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
191	Solar/Wind	Color	Appropriately colored materials shall be selected for structures, or appropriate stains/coatings shall be applied to blend with the project's backdrop.	S
192	Solar/Wind	Color	Materials, coatings, or paints having little or no reflectivity shall be used whenever possible.	S, O
193	Solar/Wind	Color	Grouped structures shall all be painted the same color to reduce visual complexity and color contrast.	C, O
194	Solar/Wind	Color	Aboveground pipelines shall be painted or coated to match their surroundings.	C, O
195	Solar/Wind	Color	Culvert ends shall be painted or coated to reduce color contrasts with existing landscape.	C, O, D
196	Solar/Wind	Color	No paint or permanent discoloring agents will be applied to rocks or vegetation to indicate surveyor construction activity limits.	C, O, D
197	Solar/Wind	Color	Reduce graveled surfaces visual color contrast with approved color treatment practices.	S, C, O, D
198	Solar/Wind	Glare	Minimize the use of signs and project construction signs; necessary signs shall be made of nonglare materials and utilize unobtrusive colors; reverse sides of signs and mounts shall be painted or coated using the most suitable color selected from the BLM Standard Environmental Color Chart to reduce color contrasts with the existing landscape; however, placement and design of any signs required by safety regulations must conform to these regulations.	S, C, O
199	Solar/Wind	Transmission	Monopoles may reduce visual impacts more effectively than lattice towers in foreground and middleground views within built or partially built environments, while lattice towers tend to be more appropriate for less developed rural landscapes where the latticework would be more transparent against background textures and colors.	S, O
200	Solar/Wind	Transmission	All electrical collector lines shall be buried where possible. All electrical collector lines shall be buried in a manner that minimizes additional surface disturbance (e.g., along roads or other paths of surface disturbance).	S, C
201	Solar/Wind	Transmission	Communication and other local utility cables shall be buried where feasible.	C, O
202	Solar/Wind	Helicopter use	In visually sensitive areas, air transport capability shall be used to mobilize equipment and materials for clearing, grading, and erecting transmission towers, thereby preserving the natural landscape conditions between tower locations, and reducing the need for permanent and/or temporary access roads.	C, O, D
203	Solar/Wind	Waste removal	Establish a regular litter pick-up procedure within and around the perimeter of the project site.	C, O, D
204	Solar/Wind	Waste removal	"Good housekeeping" procedures shall be developed to ensure that the site is kept clean of debris, garbage, fugitive trash or waste, and graffiti; to prohibit scrap heaps and dumps; and to minimize storage yards. Mitigation measures regarding waste management (Section 5.20.3) shall be applied.	C, O, D

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
205	Solar/Wind	Maintenance	Maintenance activities shall include dust abatement (in arid environments) and noxious weed control.	O
206	Solar/Wind	Maintenance	Road maintenance activities shall avoid blading existing forbs and grasses in ditches and adjacent to roads.	O
207	Solar/Wind	Revegetation	Cut slopes shall be randomly scarified and roughened to reduce texture contrasts with existing landscapes and aid in revegetation.	C, O, D
208	Solar/Wind	Revegetation	A combination of seeding, planting of nursery stock, transplanting of local vegetation within the proposed disturbance areas, and staging of construction enabling direct transplanting shall be considered. Where feasible, native vegetation shall be used for revegetating, establishing a composition consistent with the form, line, color, and texture of the surrounding undisturbed landscape.	C, O, D
209	Solar/Wind	Revegetation	Edges of revegetated areas shall be feathered to reduce form and line contrasts with the existing landscapes.	C, O, D
210	Solar/Wind	Revegetation	Stockpiled topsoil shall be reapplied to disturbed areas and the areas revegetated by using a mix of native species selected for visual compatibility with existing vegetation, where feasible, or a mix of native and non-native species if necessary to ensure successful revegetation.	C, O, D
211	Solar/Wind	Mitigation	The full range of visual best management practices shall be considered, and plans shall incorporate all pertinent BMPs. Visual resource monitoring and compliance strategies shall be included as a part of the project mitigation plans to cover the construction, operation and decommissioning phases.	C, O, D
212	Solar/Wind	Mitigation	Visual impact mitigation objectives and activities shall be discussed with equipment operators before construction activities begin.	C, O, D
213	Solar/Wind	Screening	Where screening topography and vegetation are absent, natural-looking earthwork landforms and vegetative or architectural screening shall be used to minimize visual impacts. Vegetative screening can be particularly effective along roadways.	S, O
214	Solar/Wind	Reclamation	All areas of disturbed soil shall be reclaimed by using weed-free native grasses, forbs, and shrubs representative of the surrounding and intact native vegetation composition and/or use non-native species, if necessary to ensure successful revegetation.	C, O, D
215	Solar/Wind	Reclamation	Rocks, brush, and forest debris shall be restored whenever possible to approximate pre-existing visual conditions.	C, O, D
216	Solar/Wind	Reclamation	Interim restoration shall be undertaken during the operating life of the project as soon as possible after disturbances.	C, O, D

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
Water Resources				
217	Solar	Water supply	Use the minimum volume of water necessary for mirror washing. Collecting and recycling the wash water is encouraged.	O
218	Solar/Wind	Water supply	Water use shall be minimized by implementing conservation practices, such as treating spent wash water and storing it for reuse.	C, O, D
219	Solar/Wind	Ground water	The creation of hydrologic conduits between two aquifers shall be avoided during foundation excavation and other activities.	C, O, D
220	Solar/Wind	Water quality	If drilling activities are required as part of site characterization, any drilling fluids or cuttings shall be maintained so that cuttings, fluids, or runoff from storage areas will not come in contact with aquatic habitats. Temporary impoundments for storing drilling fluids and cuttings shall be lined to minimize infiltration of runoff into groundwater or surface water.	C, O, D
221	Solar/Wind	Water quality	Washing equipment or vehicles in streams and wetlands shall be avoided.	C, O, D
222	Solar/Wind	Water quality	Project developers shall avoid or minimize and mitigate the degradation of water quality (e.g., chemical contamination, increased salinity, increased temperature, decreased dissolved oxygen, and increased sediment loads) that could result from construction activities. Water quality in areas adjacent to or downstream of development areas shall be monitored during the life of the project to ensure that water quality is protected.	C, O, D
223	Solar/Wind	Stormwater	Construction activities shall avoid land disturbance in ephemeral washes and dry lakebeds; any unavoidable disturbance would be minimized. Stormwater facilities would be designed to route flow around the facility and maintain pre-project hydrographs.	C, O, D
224	Solar/Wind	Stormwater	When stream or wash crossings are constructed, culverts or water conveyances for temporary and permanent roads shall be designed to comply with county standards or to accommodate the runoff of a 100-year storm, whichever is larger.	C, O, D
225	Solar/Wind	Stormwater	Geotextile mats shall be used to stabilize disturbed channels and stream banks (CASQA 2003). Earth dikes, swales, and lined ditches shall be used to divert work-site runoff that would otherwise enter a disturbed stream (CASQA 2003).	C, O, D
226	Solar/Wind	Stormwater	Special construction techniques shall be used, where applicable, in areas of erodible soil, alluvial fans, and stream channel/wash crossings.	C, O, D
227	Solar/Wind	Reclamation	All management plans, mitigation measures, and stipulations developed for the construction phase shall be applied to similar activities during the decommissioning/reclamation phase.	D

Table B-4 *(continued)*
Best Management Practices

No.	Technology	Topic	Description of Measure	Phase
Wild Horses and Burros				
228	Solar/Wind	Design	Access roads shall be appropriately constructed, improved, and maintained and should employ appropriate signs to minimize potential horse and burro collisions. Fences should be built (as practicable) to exclude wild horses and burros from all project facilities, including all water sites built for the development of facilities and roadways.	S, C, O, D
Wildfire				
229	Solar/Wind	Safety	The effectiveness of developing and adhering to a hazardous materials and waste management plan and a fire safety plan, requiring a facility design to include isolation valves to limit HTF releases (where applicable), and providing worker training shall be considered in reducing fire risks.	S

Arizona Restoration Design Energy Project

Solar and Wind Energy Assessment of Nominated Sites

February 2012

BLM

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ACRONYMS AND ABBREVIATIONS

Acronym	Full Phrase
ACC	Arizona Corporation Commission
ADEQ	Arizona Department of Environmental Quality
AZGFD	Arizona Game and Fish Department
BLM	United States Department of the Interior, Bureau of Land Management
BOR	United States Department of the Interior, Bureau of Reclamation
CAP	Central Arizona Project
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRA	Community Reinvestment Act
CSP	concentrating solar power
DNI	direct normal irradiance
DOE	US Department of Energy
EPA	US Environmental Protection Agency
FUP	Free Use Permit
GIS	geographical information system
GW	gigawatt
H.R.	House of Representatives
kV	kilovolt
kW	kilowatt
kWh	kilowatt hour
m^2	square meter
mph	miles per hour
MW	megawatt
MWh	megawatt hour
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NREL	National Renewable Energy Laboratory
OHV	off-highway vehicle
PPA	power purchase agreement
PV	photovoltaic
RCRA	Resource Conservation and Recovery Act of 1976
RDEP	Restoration Design Energy Project
REST	Renewable Energy Standard and Tariff
ROW	right-of-way
SRMA	Special Recreation Management Area

ACRONYMS AND ABBREVIATIONS *(continued)*

	Full Phrase
SRP	Salt River Project
US	United States
USC	United States Code
VRM	Visual Resource Management

EXECUTIVE SUMMARY

INTRODUCTION

On January 13, 2010, the United States (US) Department of the Interior, Bureau of Land Management (BLM) Arizona State Office launched the Restoration Design Energy Project (RDEP) in an effort "to identify sites and/or areas managed by the BLM that may be suitable for the development of renewable energy and to establish appropriate design criteria for such projects" (Federal Register, Volume 75, Number 8, page 1807).

As part of the RDEP, the BLM is exploring opportunities to sustainably reuse disturbed lands with renewable energy potential in order to meet the demand for renewable energy generation, and address remediation and restoration requirements for the sites. Various types of solar and wind energy technology can be considered viable options for renewable energy development on previously disturbed sites and areas with low resource conflicts. These technologies evaluated in this report include:

- Utility and distributed scale solar power technologies, including concentrating solar power (CSP) and photovoltaic (PV), and
- Wind, including utility and community scale.

Based on an extensive public outreach process, the BLM and public identified 64 previously disturbed sites on federal (including BLM-administered), state, municipal, and private lands that may potentially be suitable for renewable energy development. Site types include gravel pits, mine sites, landfills, isolated parcels that have been disturbed, marginal or impaired agricultural lands, abandoned unauthorized airstrips, and Central Arizona Project (CAP) right-of-ways (ROW). These 64 sites are not an exhaustive list, as there may be other disturbed lands in the state; however, they serve as a reasonable sample to understand the potential issues associated with reuse for renewable power on disturbed lands. Detailed *Nominated Site Profiles* that summarize existing

resources, contamination/remediation concerns, and solar and wind potential for each site are provided in **Section 7**, Nominated Site Profiles.

Objective

This report evaluates the feasibility of the 64 previously disturbed sites in Arizona as sites for solar and wind energy technology. The objectives of this report are to:

- provide background information for the nominated sites, including solar and wind energy potential, environmental characteristics, potential remediation or restoration requirements; and
- based on site characteristics, assess the potential for solar and wind energy development on the nominated sites.

To assess the potential of each site, BLM developed a site-screening process that was used to evaluate the nominated sites for solar and wind energy development.

Scope

This renewable resource assessment only analyzes the initial feasibility of redeveloping the 64 RDEP nominated sites with solar and wind energy development. Additionally, while Arizona has potential for rooftop solar and cogeneration of renewable energy along with conventional energy production facilities, the scope of this analysis is limited to on-the-ground CSP and PV solar energy technology (including utility and distributed scale), and utility and community wind energy technology.

Siting Renewable Energy on Previously Disturbed Lands

The benefits of developing on disturbed lands, such as brownfields, landfills, mine sites, and marginal or impaired agricultural lands, are well established; however, siting renewable energy on these types of lands can be complicated. Developers need to consider the environmental laws and regulations at the federal, state, and local level.

A disturbed site's characteristics may present unique environmental considerations and need to be carefully examined during the planning stage.

- **Site contamination.** The severity of site contamination may limit redevelopment opportunities.
- **Environmental liability.** If leasing land, work with the owner to determine liability for issues that may arise during renewable energy construction, operation, and decommission.
- **Remediation.** Consider the types of remediation required and the technology required for remediation tasks.

Developers also need to contend with technical issues related to construction and operation of renewable energy technologies on these types of sites. Key technical considerations include:

- **Proximity to transmission.** If the electricity generated will be sent off-site, consider whether the site has adequate transmission interconnection opportunities.
- **System size.** How large will the onsite system be and will it conflict with the local electric grid's capacity?
- **Usable acreage.** How much of the site can be utilized for renewable energy development? Does slope, aspect, or structures obstruct the resource?
- **Surrounding land uses.** Developers should determine the surrounding land uses, including open space and conservation areas, and their compatibility with renewable energy development.

Some of the more notable advantages to developing on these sites include the following: infrastructure; terrain; property size; zoning; reciprocal interest; public and community relations; reduced liability and cleanup costs; and tax and financial incentives.

Brownfields

Cleaning up and reinvesting in brownfields increases local tax bases, facilitates job growth, utilizes existing infrastructure, takes development pressures off of undeveloped, open land, and improves and protects the environment. Brownfields may offer several of the advantages listed above that can result in cost and time savings for the developer. However, certain site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on brownfields. For example, smaller sites may not support utility-scale wind development or certain solar energy technologies. Brownfields may also pose unique environmental considerations. Existing buildings or other obstructions can limit the placement of renewable energy infrastructure. If the site is classified by the US Environmental Protection Agency (EPA), renewable energy might conflict with the cleanup and investigation schedule. On-going remediation requirements may limit the type and location of solar and wind energy facilities.

Landfills

Landfills are also being identified as potential areas for solar and wind energy generation and may offer several of the advantages listed above. Some landfill site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on a landfill. For example, portions of the landfill may still be active and avoided during construction activities. Gas collection systems may require setbacks and other siting considerations. The search for a suitable site shouldn't be limited to closed landfills. Active landfills

where a portion of the site has been closed may also be acceptable for renewable energy development and landfill operators may be actively seeking a clean energy partnership.

Mine Sites

Mine sites may also pose unique environmental considerations that may impose restrictions on the type and amount of renewable energy that can be developed on an active or closed mine site. For example, vertical cuts in the land can present a significant danger when in close proximity to structures or roads, and structures built above or below highwalls may be damaged by falling rock, and building near a highwall can also increase safety concerns. Other concerns include settlement, subsidence, landslides, and drainage.

Marginal or Impaired Agricultural Lands

With continuing use of incentives to generate renewable energy, developers have also demonstrated a preference for marginal and impaired private lands, particularly agricultural parcels that may no longer be economically viable for agricultural production or where land is taken out of farm production for lack of water. They are often attracted to this farmland because of its proximity to existing electricity infrastructure such as transmission lines and substations. The degraded nature of the land may also make it less likely to have significant biological, environmental, or agricultural value that may make the land unsuitable for renewable energy development.

Technical feasibility of solar and wind developments on brownfields, landfills, mine sites, and marginal or impaired agricultural lands depends on compatibility of the solar or wind systems with the existing site components, including ongoing remediation, slope stability, settlement, foundation considerations, maintaining integrity of the cap system (landfills), and drainage.

SOLAR AND WIND ENERGY TECHNOLOGY AND DEVELOPMENT CONSIDERATIONS

Solar Technologies

Solar radiation may be harnessed through various technologies and transformed to usable energy, such as heat and electricity. Two basic solar energy technologies that produce electrical power are CSP systems and PV systems. CSP technologies use mirrors to concentrate sunlight onto receivers that convert it to heat. The thermal energy is then used to drive a generator via steam turbine or heat engine to produce electricity. CSP technologies require cooling of the exhaust steam so that it condenses back into water before being heated again into steam. CSP technologies are the most suitable solar technologies for large utility-scale applications. The three main types of CSP technologies are linear concentrator, dish/engine, and power tower systems.

PV systems use solar cells consisting of semiconductor materials similar to those used in computer chips to capture the energy in sunlight and convert it directly into electricity. PV systems must be scaled over a very large area in order to be

effective for utility-scale applications. There are two types of PV systems in use today: flat-plate systems and concentrated PV systems.

Wind Technologies

Wind turbines are available in a variety of sizes, and, subsequently, a variety of power ratings. Utility-scale wind turbines for land-based wind farms have rotor diameters ranging from 130 to about 395 feet, and towers that reach 130 to 425 feet high. Utility-scale turbines range in power rating from 100 kilowatt (kW) to as large as several megawatts (MWs). Larger turbines are grouped together into wind farms, which provide bulk power to a utility power grid. Wind power plants are modular, which means they consist of small individual modules (turbines), and, depending on electricity demand, can easily modify production capacity.

Development Considerations

Solar and wind power generation depends on selecting a suitable site, including consideration of access roads and interconnections with the transmission grid. Many different factors determine whether a particular site warrants consideration for potential solar or wind power generation. Once a preliminary screening is completed, developers will want to conduct more detailed research before committing to project construction and operation. Steps to undertake may include resource surveys (e.g., rare plants, biological, or cultural surveys), soil studies, surface hydrology and wetlands mapping, and microsite meteorological testing. Developers will also want to calculate the cost necessary to construct access roads (if necessary) and consider any compatibility issues with surrounding land uses. Finally, power purchase agreements (PPA) and transmission grid interconnection are critical financial aspects of any project and will vary by location.

Overall, developers are looking for a site that can generate revenue. Developers look for areas where regulatory and funding programs are in place to encourage development of solar projects. Having these types of programs in place help expedite the process and can provide financial incentives to ensure the project is economically feasible. Other features developers look for include flat land, nearby transmission connections, older disturbed lands, and good solar potential. These factors ultimately determine the costs associated with development and their influence on a developers return on investment.

Solar and Wind Market Trends

Annual US grid-connected PV installations doubled to 890 MW in 2010 compared with installations in 2009 (IREC 2011). The largest growth of grid-connected PV occurred in the utility sector. Although the number of utility PV installations remains small, the average system size is over 1.45 MW. The average size of grid-connected PV installations varies from state-to-state, depending on available incentives, interconnection standards, net metering regulations, solar resources, retail electricity rates, and other factors. In 2010

Arizona had 63.6 MW of grid-connected PV capacity installed, a 201 percent change from 2009 which saw 21.1 MW of capacity installed.

In 2010 the demand for CSP was insignificant. However, there are several very large projects currently under development in California and Arizona. There is greater uncertainty with the future growth of CSP technology in the US due to financing, permitting, water use, and environmental approvals because of the large land requirements for this type of technology.

The US wind power market slowed in 2010. Through 2010, Arizona had cumulative total of 128 MW of utility-scale wind power (AWEA 2011). Wind power installations in 2010 were similar in magnitude to those recorded in 2007; however they were just half those seen in 2009 and were 40 percent lower than in 2008. With federal incentives for wind energy in place through 2012, an improved project finance environment in 2010 and early 2011, and lower wind turbine and wind power pricing, modest growth in annual wind power capacity appears likely in 2011 relative to 2010.

RDEP Solar and Wind Site Assessment

The general goal of the analysis is to provide a preliminary assessment of the overall potential for developing solar or wind energy on each of the nominated sites. As discussed below, several criteria were developed to inform the preliminary assessment.

Solar Assessment

Each nominated site was given a weighted score on a scale of 0 (least development potential) to 100 (best development potential) based on slope of the terrain; solar resource availability; distance to existing transmission lines, interconnections, and roads; and the presence of sensitive resources and potentially incompatible land use designations. This analysis provides a first-level screening to identify areas that merit further scrutiny for solar or wind resource development. The solar energy analysis does not differentiate between CSP and PV technologies. However, because available technology currently requires a large land area to be commercially viable, sites less than 100 acres are noted in the site profiles (**Section 7**, Nominated Site Profiles) for their possible incompatibility with large-scale or central CSP projects.

Results

Utilizing the methodology outlined above, each site was given a score that corresponds to their potential for solar energy development.

Table ES-1, RDEP Nominated Sites Solar Screening Results, shows the scores for each nominated site.

Table ES-1
RDEP Nominated Sites Solar Screening Results

Site Number	Site Name	Solar Screening Results	Site Number	Site Name	Solar Screening Results
1	19th Street Landfill	**88.5**	34	La Osa Surface Disturbance	**88**
2	Belmont Mountain CAP	**88.5**	35	Litchfield Park Urban Parcel	**97**
3	Belmont Proposed Disposal	**82.5**	36	Little Harquahala CAP	**86**
4	Black Canyon City Landfill	**91**	37	Los Reales	**88.5**
5	Black Rock Gypsum Mine	**76.5**	38	Mobile Proposed Disposal	**91.5**
6	Bouse Hills CAP	**86.5**	39	Mokaac Gravel Pit	**88.5**
7	Brady Central CAP	**85**	40	Old Yuma County FUP	**91.5**
8	Brady Wash Pipeline	**74.5**	41	Page Landfill	**97**
9	Butler Valley	**88.5**	42	Prudence	**81**
10	Cave Creek 2	**91**	43	Quartzite Area	**85.5**
11	Cave Creek Landfill	**88**	44	Red Gap Ranch	**100**
12	Chevron Vacant Land	**79.5**	45	Red Rocks CAP	**82.5**
13	Christmas Mine	**63**	46	Ryan	**94**
14	Copperstone Mine	**83**	47	Ryland	**85**
15	Cordes Lakes Hazmat	**62.5**	48	Saginaw Hill-Valhalla-Snyder Hill Mine & Quarry	**83**
16	Dateland Gravel Pit	**82**	49	Saginaw Hill	**92**
17	Detrital Wash	**91.5**	50	San Xavier Mine	**86**
18	Dogtown Mine	**85.5**	51	Silver Creek Landfill	**65.5**
19	Empire Farms	**94**	52	Silverbell	**91**
20	Florence-Price Dump	**85**	53	Snowflake Mine	**71**
21	Foothills Proposed Disposal	**78.5**	54	Snyder Hill Mine	**89**
22	Forepaugh Airport	**94**	55	Sonoita Landfill	**85.5**
23	Fredonia Landfill	**86**	56	St. Mary's	**91**
24	Fredonia OHV Area	**73**	57	Tombstone Landfill	**83.5**
25	Granite Hill Landing Strip	**85.5**	58	Torrez-Brant	**97**
26	Harcuvar Substation	**91**	59	Tumamoc	**73.5**
27	Harquahala CAP	**100**	60	Twin Peaks-Sandrio CAP	**88.5**
28	Harrison Road	**62.5**	61	Valhalla	**92**
29	Hartman Wash Mine	**57**	62	Vincent Mullins	**73**
30	Hassayampa Landfill	**89**	63	White Sage Gravel Pits	**82**
31	Hassayampa CAP	**94.5**	64	Wildcat Hill	**94.5**
32	Irvington	**78**			
33	Jones Private Property	**85**			

Wind Assessment

A preliminary site assessment has been carried out by BLM to evaluate the suitability of community and utility wind technologies on the 64 nominated sites. The assessment was based on general topographic and property size suitability, wind potential rating, maximum potential MW output, distribution lines accessible for interconnecting to the grid, distance to different types of load centers, and potential sensitive resources issues. The general goal of the analysis is to provide a preliminary assessment of the overall potential for developing community or utility-scale wind energy stations on each of the 64 nominated sites.

The methodologies for community and utility wind differ in that distance to roads and transmission interconnects is considered more important for community wind development, which is typically sited close to demand centers.

Results

Only three of the nominated sites have any wind resource potential: Brady Wash Pipeline (a 6-acre portion), Red Gap Ranch (a 1,700-acre portion), and Silver Creek Landfill (an 11-acre portion) are all rated "Fair." The small number of suitable acres at Brady Wash Pipeline and Silver Creek Landfill likely eliminate them from consideration for utility wind. Under the scoring system for community wind, those sites receive 39.5 and 37.5 points, respectively. Red Gap Ranch receives 60 points for community wind and 76 points for utility wind. No other nominated sites are considered ideal for wind energy development because they lack an adequate wind resource class.

SECTION 1
INTRODUCTION

1.1 INTRODUCTION

> **Utility:** Utility-scale energy plants generate a large amount of electricity that is transmitted from one location (the energy plant) to many users through the transmission grid.
>
> **Distributed:** Energy provided by small, modular power generators (typically ranging in capacity from a few kilowatts to 50 megawatts) located at or near customer demand.
>
> **Community:** Projects are locally owned by public or private entities that utilize wind energy, and may be used for on-site power or to generate wholesale power for sale, usually on a commercial-scale greater than 100 kilowatt.

On January 13, 2010, the United States (US) Department of the Interior, Bureau of Land Management (BLM) Arizona State Office launched the Restoration Design Energy Project (RDEP) in an effort "to identify sites and/or areas managed by the BLM that may be suitable for the development of renewable energy and to establish appropriate design criteria for such projects" (Federal Register, Volume 75, Number 8, page 1807).

As part of the RDEP, the BLM is exploring opportunities to sustainably reuse disturbed lands with renewable energy potential in order to meet the demand for renewable energy generation, and address remediation and restoration requirements for the sites. Various types of solar and wind energy technology can be considered viable options for renewable energy development on previously disturbed sites and areas with low resource conflicts. These technologies evaluated in this report include:

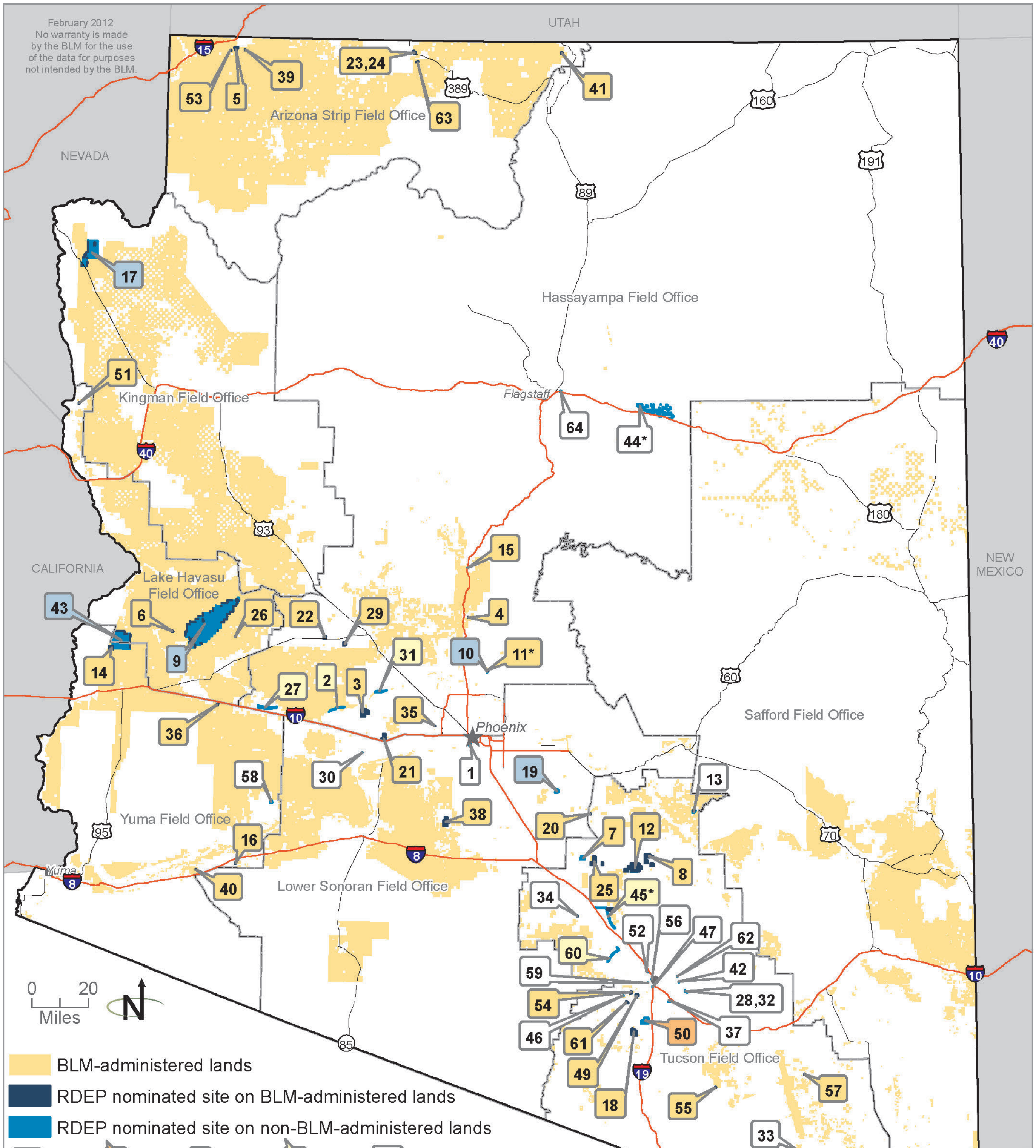
- Utility and distributed scale solar power technologies, including concentrating solar power (CSP) and photovoltaic (PV), and
- Wind, including utility and community scale.

Descriptions of solar and wind energy technologies are discussed in **Section 3**, Solar and Wind Energy Technology and Development Considerations.

Based on an extensive public outreach process, the BLM and public identified 64 previously disturbed sites on federal (including BLM-administered), state, municipal, and private lands (see **Figure 1-1**, RDEP Nominated Sites and **Table 1-1**, RDEP Nominated Site Summaries) that may potentially be suitable for renewable energy development. Site types include gravel pits, mine sites, landfills, isolated parcels that have been disturbed, marginal or impaired

RDEP Nominated Sites

Based on an extensive public outreach process, the BLM and public identified 64 suitable previously disturbed sites on BLM-administered, state, municipal, private and other federal lands.



Source: BLM 2011b

Please see Table 1-1 RDEP Nominated Site Summaries, for RDEP nominated sites' names corresponding to the numbers on this figure. Site 48 (not shown on map) is comprised of sites 49, 54, and 61. *Sites have multiple ownerships, majority ownership is displayed. The number of sites per landownership type is displayed.

Figure 1-1

Table 1-1
RDEP Nominated Site Summaries

Site Number	Site Name	County	Land Owner	Acres	Site Type
1	19th Street Landfill	Maricopa	Private	191	Landfill
2	Belmont Mountain CAP	Maricopa	BOR	841	CAP right-of-way
3	Belmont Proposed Disposal	Maricopa	BLM	3,174	Isolated fragment
4	Black Canyon City Landfill	Yavapai	BLM	25	Landfill
5	Black Rock Gypsum Mine	La Paz	BLM	679	Mine
6	Bouse Hills CAP	La Paz	BLM	120	CAP right-of-way
7	Brady Central CAP	Multiple	BLM	1,023	CAP right-of-way
8	Brady Wash Pipeline	Pinal	BLM	3,240	Utility corridor
9	Butler Valley	La Paz	State	83,013	Agricultural
10	Cave Creek 2	Maricopa	State	68	Landfill
11	Cave Creek Landfill	Maricopa	BLM/ State	42	Landfill
12	Chevron Vacant Land	Pinal	BLM	7,812	Vacant
13	Christmas Mine	Gila	Private	496	Mine
14	Copperstone Mine	La Paz	BLM	929	Mine
15	Cordes Lakes Hazmat	Yavapai	BLM	14	Hazardous materials site
16	Dateland Gravel Pit	Yuma	BLM	64	Mineral material
17	Detrital Wash	Mohave	State	17,695	Detrital wash
18	Dogtown Mine	Pima	BLM	2,080	Mine
19	Empire Farms	Pinal	State	682	Agricultural
20	Florence-Price Dump	Pinal	BLM	85	Landfill
21	Foothills Proposed Disposal	Maricopa	BLM	1,355	Isolated fragments
22	Forepaugh Airport	Maricopa	BLM	635	Disturbed area
23	Fredonia Landfill	Coconino	BLM	21	Landfill
24	Fredonia OHV Area	Coconino	BLM	348	Recreation area
25	Granite Hill Landing Strip	Pinal	BLM	2,656	Previous landing strip
26	Harcuvar Substation	La Paz	BLM	59	Utilities
27	Harquahala CAP	La Paz and Maricopa	BOR	1,910	CAP right-of-way
28	Harrison Road	Pima	Private/ State	65	Landfill
29	Hartman Wash Mine	Maricopa	BLM	678	Mine
30	Hassayampa Landfill	Maricopa	Private	9	Landfill
31	Hassayampa CAP	Maricopa	BOR	723	CAP right-of-way
32	Irvington	Pima	Private/ State	13	Landfill
33	Jones Private Property	Cochise	Private	156	Agricultural

Table 1-1
RDEP Nominated Site Summaries

Site Number	Site Name	County	Land Owner	Acres	Site Type
34	La Osa Surface Disturbance	Pinal	Private	41	Disturbed area
35	Litchfield Park Urban Parcel	Maricopa	BLM	41	Disturbed area
36	Little Harquahala CAP	La Paz	BLM	159	CAP right-of-way
37	Los Reales	Pima	Private	248	Landfill
38	Mobile Proposed Disposal	Maricopa	BLM	2,843	Isolated fragments
39	Mokaac Gravel Pit	Mohave	BLM	80	Mineral material
40	Old Yuma County FUP	Yuma	BLM	27	Mineral material
41	Page Landfill	Coconino	BLM	160	Landfill
42	Prudence	Pima	Private	9	Landfill
43	Quartzite Area	La Paz	State	22,131	Agricultural
44	Red Gap Ranch	Coconino	State/ Private	7,984	Agricultural
45	Red Rocks CAP	Pinal and Pima	BOR/ BLM	2,213	CAP right-of-way
46	Ryan	Pima	Private	16	Landfill
47	Ryland	Pima	Private	27	Landfill
48	Saginaw Hill-Valhalla-Snyder Mine & Quarry	Pima	BLM	997	Mine
49	Saginaw Hill (1/3 of SVS Mine & Quarry)	Pima	BLM	332	Mine
50	San Xavier Mine	Pima	Tribal	2,573	Mine
51	Silver Creek Landfill	Mohave	BLM	50	Landfill
52	Silverbell	Pima	Private	36	Landfill
53	Snowflake Mine	Mohave	BLM	24	Mine
54	Snyder Hill Mine (1/3 of SVS Mine & Quarry)	Pima	BLM	332	Mineral material
55	Sonoita Landfill	Santa Cruz	BLM	39	Landfill
56	St. Mary's	Pima	Private	10	Landfill
57	Tombstone Landfill	Cochise	BLM	43	Landfill
58	Torrez-Brant	Maricopa	Private	408	Agricultural
59	Tumamoc	Pima	Private	21	Landfill
60	Twin Peaks-Sandrio CAP	Pima	BOR	888	CAP right-of-way
61	Valhalla (1/3 of SVS Mine & Quarry)	Pima	BLM	332	Disturbed area
62	Vincent Mullins	Pima	Private	32	Landfill
63	White Sage Gravel Pits	Coconino	BLM	61	Mineral material
64	Wildcat Hill	Coconino	Private	75	Brownfield

agricultural lands, abandoned unauthorized airstrips, and Central Arizona Project (CAP) right-of-ways (ROW). These 64 sites are not an exhaustive list, as there may be other disturbed lands in the state; however, they serve as a reasonable sample to understand the potential issues associated with reuse for renewable power on disturbed lands.

Detailed *Nominated Site Profiles* for each site are provided in **Section 7**, Nominated Site Profiles, and include the following information:

- Location facts, including site size, location, previous land use, adjacent land use(s), and surface and mineral ownership;
- Site characteristics, including solar and wind potential rating, estimated solar and wind generation capacity, developable acres, distance to graded roads, distance to transmission interconnections, and groundwater;
- Select environmental factors, including those for wildlife, vegetation, sensitive or listed species, wetlands, hydrology, special designations, land use, etc.;
- Site opportunities and constraints;
- Suggested remediation and restoration requirements; and
- Summary describing the overall potential of the site for renewable energy development.

> To facilitate site nominations, the BLM launched a Web site with RDEP information and nomination forms. During scoping, the BLM received 42 site nominations from local, state, and federal agencies, private companies, and the public. The BLM has continued to receive nominations, resulting in a total of 64 nominated sites.

These profiles are intended to provide a preliminary indication of whether or not a particular site is suitable for solar or wind energy development. The information contained within this site summary has been created to give an overview of each site and is not a guarantee of a site's suitability for energy development. Developers should consult with appropriate government agencies and undertake further research before making a final determination on a site's suitability for their project(s).

1.2 Objective

This report evaluates the feasibility of the 64 previously disturbed sites in Arizona as sites for solar and wind energy technology. The objectives of this report are to:

- provide background information for the nominated sites, including solar and wind energy potential, environmental characteristics, potential remediation or restoration requirements; and
- based on site characteristics, assess the potential for solar and wind energy development on the nominated sites.

To assess the potential of each site, BLM developed a site-screening process that was used to evaluate the nominated sites for solar and wind energy

development. For the purposes of this analysis, the potential for solar and wind energy development can be determined by the area of developable land; solar and wind resource availability; distance to transmission lines (interconnections), load centers and roads; sensitive resources; and land management status.

1.3 SCOPE

Although over 52 percent of the land in Arizona supports adequate solar resources and approximately two percent has adequate wind resources, this renewable resource assessment only analyzes the initial feasibility of redeveloping the 64 RDEP nominated sites with solar and wind energy development. Additionally, while Arizona has potential for rooftop solar and cogeneration of renewable energy along with conventional energy production facilities, the scope of this analysis is limited to on-the-ground CSP and PV solar energy technology (including utility and distributed scale), and utility and community wind energy technology.

There are many issues that must be addressed when considering renewable energy as a redevelopment option, and an appropriate resource siting is only one. Other issues not considered in this report include policies, tax incentives, financing, and technology changes. Further technical and financial analysis of the nominated sites will be needed to determine the optimal sites for development of specific types of solar and wind energy technology. The assessment was conducted using geographical information system (GIS) analysis (see **Section 6**, References and Data Sets for GIS Screening).

1.4 REPORT ORGANIZATION

Following this introductory section, Section 2 provides background information for considering solar and wind energy development on brownfields, landfills, and mine sites. An overview of solar and wind technology and development is provided in Section 3. Sections 4 and 5 present the solar and wind site assessments. References and GIS data sets are provided in Section 6. The nominated site profiles are included in Section 7.

SECTION 2
SITING RENEWABLE ENERGY ON PREVIOUSLY DISTURBED LANDS

2.1 BACKGROUND

Renewable energy development on previously disturbed lands is relatively new and growing in acceptance and popularity, and is often considered to be sustainable development. Sustainable development has numerous definitions depending on usage, but most sources cite the 1987 United Nations World Commission on Environment and Development report "Our Common Future" definition of "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." In this context of developing renewable energy, sustainable development hinges on balancing developing energy to meet a community's needs while preserving undisturbed lands.

US Environmental Protection Agency's (EPA) Office of Solid Waste and Emergency Response states the reasons for pursing renewable energy projects on disturbed lands may include (EPA 2005a):

- Taking stress off undeveloped lands for construction of new energy facilities;
- Using existing transmission capacity and infrastructure of formerly developed lands;
- Providing economically viable reuse to sites with significant cleanup costs or low real estate development demand; and
- Spurring needed investment in both urban and rural communities, and creating jobs.

This section identifies issues and concerns that should be addressed by communities, agencies, and developers interested in developing renewable energy on previously disturbed lands. The information presented will help define

key aspects that need to be addressed in order to successfully site renewable energy development on previously disturbed lands. However, interested parties will need to further investigate the site prior to making a final determination on a site's suitability for their project(s). The section begins with highlighting common regulatory requirements and factors to be considered regardless of the type of disturbed land sites, followed by specific information related to reusing brownfields, landfills, mine sites, and marginal or impaired agricultural lands for renewable energy development.

2.2 Regulations and Resources

The benefits of developing on disturbed lands are well established; however, siting renewable energy on disturbed lands can be complicated. Developers need to consider the environmental laws and regulations at the federal, state, and local level. The following is a condensed summary representative of regulations involved in developing on previously disturbed land. A sampling of resources available for developing on previously disturbed sites is also provided.

2.2.1 Federal Regulations

- **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund.** This federal act (42. United States Code [USC] 9601–9675) created a tax to fund a federal cleanup program for contaminated sites, including sites that fall under EPA's National Priorities List.
- **Small Business Liability Relief and Brownfields Revitalization Act.** This federal law (Public Law 107-118 [House of Representatives (H.R.) 2869]) provides certain relief for small businesses from liability under CERCLA, and to promote the cleanup and reuse of brownfields (including landfills and mine sites) to provide financial assistance for revitalization, to enhance state response programs, and for other purposes.
- **Resource Conservation and Recovery Act (RCRA).** This federal act (42 USC Section 6901 et seq.) gives EPA the authority to regulate the treatment of hazardous waste from manufacturing to disposal. State and local governments are responsible for the implementation of RCRA, including the Arizona Department of Environmental Quality (ADEQ) Waste Programs Division.
- **Community Reinvestment Act (CRA).** By requiring banks and other lenders to make capital available in low-income zones, this federal act (12 USC 2901) encourages development in areas likely to include brownfields. The EPA provides incentives for brownfield redevelopment through the CRA.
- **National Environmental Policy Act (NEPA).** Compliance with the NEPA is required for any project with a federal nexus, such as

construction on federal land, transmission line siting on federal land, federal funding (e.g., US Department of Energy [DOE] Loan Guarantee Program), or interconnection with the federal grid (e.g., Western Area Power Administration).

- **Federal Permits.** Depending on the site and project characteristics, these can include consultation and approval from the National Pollutant Discharge Elimination System, Federal Aviation Administration, US Fish and Wildlife Service, US Army Corps of Engineers, and others. These agencies will often advise developers on common design features, mitigation measures, and/or best management practices necessary to obtain required permits.
- **Surface Mining Control and Reclamation Act.** This federal act (30 USC Sections 1201-1328) establishes a program for regulating surface coal mining and reclamation activities. The act creates an Abandoned Mine Reclamation Fund for use in reclaiming and restoring land and water resources adversely affected by coal mining practices.

2.2.2 State and Local Regulations

- **State Permits.** Arizona agencies may require transmission routing permits, Arizona Corporation Commission (ACC) approval, resource surveys, or other permits. State agency contacts can assist developers with questions and identification of potential site constraints early in the process.
- **Land Use Regulations.** Local zoning requirements and other land use regulations must be compatible to renewable energy development and site reuse. Many land use policies and regulations currently do not address solar and wind power generation as a land use separate from other major utility facilities (e.g. power generating plants, substations, refuse collection, transfer, and disposal facilities) which are allowed in most zoning districts with a special use permit. Solar developers prefer clearly documented policies, requirements, and standards that reduce the potential for surprises in the entitlement process.

2.2.3 Resources

- **Brownfields National Partnership Action Agenda.** Coordinated by the EPA, this program outlines federal efforts to encourage private and state and local government redevelopment of brownfield sites (EPA 2002).
- **Brownfields Redevelopment Toolbox.** ADEQ developed this Toolbox to explain the brownfields process and to help guide redevelopment of these sites from start-to-finish. The Toolbox

identifies five steps in the brownfields renewal process (ADEQ 2010).

- **The Abandoned Mine Site Characterization and Cleanup Handbook.** While not official policy, this comprehensive resource, published by the EPA in 2000, draws on decades of experience to guide project managers through the reclamation of abandoned mines (EPA 2000).
- **Mine Site Cleanup for Brownfields Redevelopment: A Three-Part Primer.** Provides information about the cleanup aspects of mine site redevelopment, including new and innovative approaches to more efficiently characterize and clean up those sites. The use of these approaches to streamline characterization and remediation of mine sites offers the potential for redevelopment at a lower cost and within a shorter timeframe (EPA 2005b).

2.3 Site Contamination, Liability and Remediation

A site's characteristics may present unique environmental considerations and need to be carefully examined during the planning stage.

- **Site contamination.** The severity of site contamination may limit redevelopment opportunities.
- **Environmental liability.** If leasing land, work with the owner to determine liability for issues that may arise during renewable energy construction, operation, and decommission.
- **Remediation.** Consider the types of remediation required and the technology required for remediation tasks.

The passage of CERCLA (the Superfund Act) provided provisions to protect landowners from site contamination liability issues that were not caused by them. The due diligence process that evolved out of the liability concerns lead to the passage of the Small Business Liability Relief and Brownfields Revitalization Act. This act created various liability assurances for those who acquire contaminated properties. The act defines the steps one must take to conduct "All Appropriate Inquiry" (due diligence) prior to purchase of a potentially contaminated site, dictates what type of professionals may perform the due diligence, and provides grant funding to perform cleanups. Under the act, Phase I studies must be conducted to meet the criteria of "All Appropriate Inquiry" and establish a buyer as a Bona Fide Prospective Purchaser.

Being a Bona Fide Prospective Purchaser provides release from liability for existing environmental problems at the time of purchase (as long as the new owner doesn't make the pollution situation worse and takes immediate steps to remediate). If a landowner follows the steps set forth in statute the liability exposure is quantified and capped, providing a higher degree of liability protection and certainty to the redevelopment process.

The EPA has prepared two documents addressing liability concerns with contaminated sites. "Revitalizing Contaminated Sites: Addressing Liability Concerns (The Revitalization Handbook)" addresses environmental cleanup liability risks associated with the revitalization of contaminated property or sites (EPA 2011a). The “Siting Renewable Energy on Contaminated Properties: Addressing Liability Concerns” fact sheet provides answers to some common questions that developers of renewable energy projects on contaminated properties may have regarding potential liability for cleaning up contaminated properties. It also includes a Reference Section listing key EPA documents and Web sites, and endnotes citing specific provisions discussed in the fact sheet that provide additional information.

Remediation is necessary when contamination exceeds a standard or poses an unacceptable risk to public health and the environment. Often remediation can be done as part of the development plan. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. It has been found that many contaminants degrade naturally, thereby limiting the scope of cleanup. Removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

In many instances the mere presence of contamination does not always justify cleanup. It is the exposure or potential exposure of populations to unsafe levels of contamination that triggers a cleanup. It may be that the contamination does not pose a threat to public health and the environment within the proposed redevelopment scheme.

Groundwater cleanup criteria usually rely on a maximum contaminant level. The remediation plan may propose a risk-based closure for a specific use. Risk-based closure means that contamination may be left on site. For instance, cleanup for solar and wind energy use may allow for a higher contaminant level than if the site were to be used for residential construction. Similarly, a risk-based closure may entail eliminating exposure pathways, i.e., capping the soil so there is no human contact.

Environmental covenants may be needed to notify future parties about persistent contamination that may be left in place under a risk-based closure. This is a method of managing the site to prevent exposure to future site users. For instance, industrial cleanup standards are not quite clean enough for residential use; the environmental covenant will notify future residential developers that additional cleanup needs to be performed. If waste is consolidated in an onsite location and capped, an environmental covenant would notify future property owners not to dig in that location, or to have a plan to deal with the buried waste.

Lessons Learned

The development of a 40-acre solar farm at the Aerojet General Corporation Superfund site in Sacramento, California is an example of successful renewable energy projects and green remediation at contaminated lands. Reuse of the Aerojet General Corporation Superfund site provided a range of broad lessons learned that can help guide similar projects at contaminated lands in Arizona (EPA 2010).

1. EPA works with potentially responsible parties and other stakeholders to support green remediation and reuse projects like renewable energy development that are compatible with site cleanups. EPA places a high priority on green remediation and the development of renewable energy opportunities as part of the reuse of contaminated lands. At the Aerojet General Corporation site, EPA's coordination with Aerojet enabled the siting of the facility in an appropriate location and with an appropriate design that ensured flexibility if future investigation and remediation is necessary.
2. While EPA provides tools and resources to support Superfund reuse, communities and public and private sector organizations make it happen. EPA relies on engaged community stakeholders to bring their future land use goals and priorities to the table so that this information can be incorporated as part of the remedial process, linking cleanup and redevelopment. Aerojet shared its solar energy plans and worked cooperatively with EPA. When possible, future use plans should be shared with EPA as early in the remedial process as is feasible.
3. The Superfund remedial process can provide information to fulfill environmental permitting and other regulatory requirements for renewable energy projects like solar farms. Superfund sites are among the most comprehensively documented and evaluated areas of land. Aerojet relied on detailed site investigation information from the Superfund process to address environmental permitting requirements for the site as part of its larger real estate development plans, several years before the solar farm was even under consideration. At most sites, a completed remedial investigation/feasibility study or a draft proposed plan will provide site owners and prospective purchasers with extensive site information.

Specific factors that contributed to the Aerojet project's success include:

- Aerojet energetically pursued the development of the solar farm to help power the site's ground water remediation program, motivated by economic and environmental considerations to put in place the requisite resources, partnerships and expertise.

- Aerojet worked with private and public sector partners to develop a project approach that addressed liability concerns.
- EPA and state agencies were engaged partners with thorough knowledge of the biology, geology and chemistry of the location and they supported Aerojet's green remediation goals in the context of the site's cleanup.
- EPA had selected a remedy that would be consistent with the property's reasonably anticipated future land uses.

2.3.1 Siting Factors

Developers also need to contend with technical issues related to construction and operation of renewable energy technologies on these types of sites. Key technical considerations include:

- **Proximity to transmission.** If the electricity generated will be sent off-site, consider whether the site has adequate transmission interconnection opportunities.
- **System size.** How large will the onsite system be and will it conflict with the local electric grid's capacity?
- **Usable acreage.** How much of the site can be utilized for renewable energy development? Does slope, aspect, or structures obstruct the resource?
- **Surrounding land uses.** Developers should determine the surrounding land uses, including open space and conservation areas, and their compatibility with renewable energy development.

Section 3.3, Solar and Wind Development Considerations, provides a detailed discussion of these technical issues.

2.4 BROWNFIELDS

EPA defines the term "brownfield site" as "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant" (Public Law 107-118 (H.R. 2869). Examples of Brownfields include:

- Landfills or dump sites
- Abandoned facilities
- Dry cleaning facilities
- Old gas stations
- Mine-scarred land
- Auto repair shops

Cleaning up and reinvesting in these properties increases local tax bases, facilitates job growth, utilizes existing infrastructure, takes development pressures off of undeveloped, open land, and both improves and protects the environment. Brownfields may offer several advantages that can result in cost and time savings for the developer. Some of the more notable advantages include the following:

- **Infrastructure.** Many brownfields have existing utility infrastructure on site or nearby. Given their previous use as commercial or industrial property, brownfields are often in close proximity to a road network suitable for transporting construction equipment.
- **Terrain.** The flat topography of most brownfields makes them suitable for solar or wind development.
- **Property size.** Brownfields vary tremendously in size, making it easy to tailor a renewable energy project to property's boundaries. In addition, contaminated sites may offer certain purchase or lease incentives unavailable on greenfield sites. Coupled with low competing real estate demand, the purchase or lease of brownfields can lower project costs considerably.
- **Zoning.** Brownfields are often located on lands zoned for commercial or industrial uses. In many cases, there is often no time-consuming rezoning process and adjacent landowners may not object to clean energy development of these sites for solar or wind energy.
- **Reciprocal interest.** Owners of brownfields may be looking for income opportunities and the liability relief that may accompany redevelopment.
- **Public and community relations.** Developers considering brownfield sites may receive support or an expedited permitting process from communities eager to reuse a brownfield site.
- **Reduced liability and cleanup costs.** Renewable energy development may require less intensive cleanup efforts than other potential reuses of brownfields. In addition, developers may be shielded from liability arising from existing on-site contamination.
- **Tax and financial incentives.** Municipalities may offer tax benefits to developers who agree to remediate and reuse a brownfield site. The ADEQ Brownfields Assistance Program awards grants to qualifying redevelopment projects (ADEQ 2010).

2.4.1 Technical Aspects

Site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on brownfields. For example, smaller

sites may not support utility-scale wind development or certain solar energy technologies.

Brownfields may also pose unique environmental considerations. Existing buildings or other obstructions can limit the placement of renewable energy infrastructure. If the site is classified as a brownfield by the EPA, renewable energy might conflict with the cleanup and investigation schedule. On-going remediation requirements may limit the type and location of solar and wind energy facilities.

2.4.2 Select Project Profiles

The following examples illustrate siting solar and wind energy facilities on brownfield sites.

Exelon City Solar in Chicago, Illinois. Situated on 41 acres of former industrial "brownfield" property that has been vacant for more than 30 years, the site is now remediated and restored to productive use. PV panels at Exleon City Solar now produce 10 megawatts (MW). The project came online in 2010 (Exelon 2011). Some key aspects related to development include:

- Site work began in July 2009, with Exelon performing considerable work to prepare the site for a PV plant. The site was cleared, basements and cisterns were filled, and barrels of hazardous materials were recovered and removed. As a final step, the ground was paved and 7,300 steel piers were driven into the ground.
- Undocumented underground storage tanks were located during the cleanup process and had to be removed and built around.

Casper Wind Power Project in Casper, Wyoming. Chevron is using 11 turbines on part of a former petroleum refinery to produce 16.5 MW of wind energy (Chevron 2011a). Some key aspects related to developing on brownfields include:

- Designated RCRA site; refinery produced motor fuels and asphalt.
- Risk-based soil remediation was contingent on reuse.
- Chevron investigated the site extensively and continues to fulfill their obligation to remediate site.

Bethlehem Steel Winds Project in Lackawanna, New York. A 30-acre former steel mill is now home to eight turbines with a 20 MW capacity (EPA 2011b). Some key aspects related to development include:

- Project location is a Superfund site contaminated with heavy metals and has mine acid drainage.

- Much of the construction could occur without excavating the contaminated soil.
- Windmill foundations, service roads, and green space cover the contamination.

New Rifle Mill Site in Rifle, Colorado. A 2.3 MW PV system now operates on 12 acres of contaminated land that had limited development potential for other projects (EPA 2011c). Some key aspects related to development include:

- Project location is a DOE Uranium Mine Tailings Remediation Control Act site.
- DOE performed the cleanup of surface and ground water contamination at the site.

Philadelphia Naval Yard in Philadelphia, Pennsylvania. A 1.5 MW PV system is expected to come online in 2011 at this former naval yard (EPA 2011d). Some key aspects related to development include:

- Project is a US Department of Defense Base Realignment and Closure project. Site is contaminated with heavy metals.
- Most of site required some form of cleanup (e.g., soil remediation and removal of underground storage tanks).
- Cleanup actions included soil remediation, groundwater monitoring, and a soil and vegetative cap.

2.5 LANDFILLS

In recent years, with the increasing interest in renewable energy sources, closed landfills are being identified as potential areas for solar energy generation. Closed landfills may offer several advantages, including the following:

- **Infrastructure.** Many landfills have existing utility infrastructure on site and given their proximity to urban centers, transmission interconnects may be close by. Landfills also depend on a road network capable of supporting large construction and maintenance vehicles, which can often be reused for energy project construction, operation, and maintenance.
- **Terrain.** The flat or gently sloping topography of landfills make them suitable for solar or wind development.
- **Land acquisition.** Developers can avoid a complicated acquisition process because landfills often have one or only a few owners. In addition, contaminated sites may offer certain purchase or lease incentives. Coupled with low competing real estate demand, the purchase or lease of landfills can lower project costs considerably.

- **Industrial zoning.** Renewable energy development is often considered compatible with surrounding land uses if sited on a former landfill. There is often no time-consuming rezoning process and adjacent landowners may not object to clean energy development of these sites for solar or wind energy.
- **Reciprocal interest.** Owners of closed landfills may be looking for alternative forms of income and the liability relief that may accompany redevelopment.
- **Public and community relations.** Developers considering contaminated sites may receive support or an expedited permitting process from communities eager to repurpose a closed landfill.
- **Reduced liability programs.** Where cleanup is necessary, EPA and most state voluntary cleanup programs offer mechanisms for limiting liability.

2.5.1 Technical Aspects

Site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on a landfill. For example, portions of the landfill may still be active and avoided during construction activities. Gas collection systems may require setbacks and other siting considerations. The search for a suitable site shouldn't be limited to closed landfills. Active landfills where a portion of the site has been closed may also be acceptable for renewable energy development and landfill operators may be actively seeking a clean energy partnership.

Technical feasibility of solar and wind developments on landfills depends on compatibility of the solar or wind systems with the existing landfill components.

Slope Stability

For landfills with steep slopes, re-grading and use of additional top soil can help achieve suitable slopes capable of supporting structure placement. In general steep slopes demand strong foundations (i.e., poured concrete or pre-cast concrete footings) with light weight components. Light weight solar components of appropriate mechanical loading rates with strong foundation is preferred at sloped surfaces, rather than the heavy structures associated with large solar components or wind turbines. It is also necessary to perform slope stability assessment prior to construction activities to ensure integrity of cap and adequate slope stability can be maintained (Sampson 2009).

Landfill Settlement

Physio-chemical, mechanical and bio-chemical processes change properties of disposed waste over time and cause settlement. Landfill settlements over time could result in formation of surface cracks to the final landfill cover; damages to the leachate and gas collection piping, water drainage systems and underground utilities; and formation of water holding depressions (Sampson 2009). To reduce

settlement effects, dynamic compaction is applied as controlled tamping of loose soils to raise or promote densification. For landfills, dynamic compaction can increase the material density and decreases the differential settlement (Sampson 2009). Waste removal and replacement with the clean fill could improve landfill densification. For development of previously closed landfills, application of geo-grid reinforcement can increase the cover soil strength placed above the geo-membrane. Use of adjustable components (i.e., shims and adjustable racking systems of solar mounting structures) can resist against the changes in the landfill deformations (Sampson 2009).

Foundation Considerations

Weights of the structures have a greater significance for installations on the landfill cap. Landfill cap depth needed to support a PV system depends on the dead weight loads contributed by the piers and footings (SRA 2008). Choice of suitable PV system depends on the weight of the system (i.e., tracking systems heavier than fixed tilt systems), type of waste and its properties, and side slope stability (Sampson, 2009). In general, flat surfaces have less foundation requirements. For sloped surfaces, lighter panels with a strong foundation (i.e., pre-cast or poured concrete footings) are preferred (e.g., Nellis Air Force Base single axis tracking systems) (Sampson 2009).

Maintaining Integrity of the Cap System

Maintaining the integrity of the cap is both an engineering and regulatory concern. Clearing, filling, grading, and compaction activities are generally performed during the development of the landfill for solar or wind system installation. During installation, extreme care is necessary not to damage the landfill cap or expose the waste. Installation on landfills requires good foundation placement, which depends on landfill cap characteristics to support the footings. Generally, during the planning stage, the cap design must consider anticipated loads by the PV system and its components.

For most cases, prefabricated concrete piers or concrete slabs could be sufficient enough to support a solar system. Wind turbine foundations on the landfill cap can utilize piles extended to bedrock, or floating adjustable footings, to address settlement issues. Also, requirements for trenching activities (i.e., electrical lining), existing or future landfill gas-to-energy recovery infrastructures should be considered (Sampson 2009). Adequate soil layer should exist for trenching activities with no or minimal impact on clay or geo-synthetic liner (Sampson 2009). If the landfill requires regular top surface (cap) maintenance (e.g., mowing of grass), placement of structures high enough for the operation of mowing equipment beneath the structures should be considered.

Drainage

Drainage and erosion are also major factors to consider. Developers will want to engineer methods of preserving top liners and soil caps to preserve slope stability and mitigate erosion that could degrade the cap. Drainage patterns at

closed landfills could also be impacted by renewable energy development and panel or turbine placement should be planned accordingly (Sampson 2009).

Challenges in Using Closed Landfills For Solar and Wind Generation
As discussed above, developing solar and wind energy systems on landfills present challenges. For example, Tessman Road Landfill (see **Section 2.5.2**, Select Project Profiles) employed flexible PV laminates side slopes (18 degrees) directly attached to the exposed geomembrane cover. Application of exposed geo-membrane cover with light weight panels (flexible PV strips) was a remedy for problems associated with steep side slope. In the case of Pennsauken Landfill Project, New Jersey; shallow pre-cast concrete footings were used to provide strong foundation for the PV system on the sloped surfaces overcoming complications of side slope installation. This facility used ballast foundation with crystalline panels on top surfaces for maximum energy production.

Construction of a wind turbine on a closed landfill in Hull Massachusetts used stainless steel piles extended to bedrock beneath landfill to mitigate settlement issues. In Karhlsruhe, Germany, a wind turbine was constructed on a landfill cap with a floating, adjustable spread footing foundation to correct for settlement.

2.5.2 Select Project Profiles

The following examples illustrate siting solar and wind energy facilities on landfill sites.

Fort Carson Landfill at Fort Carson Army Base, Colorado. Sited on 12 acres of a former construction debris landfill, the Army's largest solar energy project came online in early 2008 and utilizes PV panels to produce 2 MW (EPA 2011e). Some key aspects related to development include:

- Designated RCRA site; construction debris.
- Without costly excavation, capping or extensive cleanup, reuse options for the site were limited.
- Site was prepared for the solar facility by covering the inert landfill debris with two feet of soil, grading it for drainage and planting a native seed mix. Engineered cover is not required because landfill contains inert construction debris.

Holmes Road Landfill. Houston, Texas. City of Houston developed a 10 MW solar energy project on a 300 acre former landfill located near downtown. The solar farm will generate over 12.5 million kilowatt hours (kWh) annually accounting for approximately one percent of the city's annual energy purchases (EPA 2011f). Some key aspects related to development include:

- Cap depth is variable, complicating construction, tree removal, and site grading as consideration must be taken to ensure the cap's integrity.

- Utility distribution lines are located adjacent to the landfill on three sides.

Nellis Air Force Base in Clark County, Nevada. On 140 acres of a closed landfill site, this project utilizes tracking PV arrays to generate 14 MW, enough to provide 25 percent of the electricity needs at Nellis Air Force Base (EPA 2011g). Some key aspects related to development include:

- Designated RCRA site; polychlorethene and trichlorethene (methyl chloroform).
- Landfill was capped with native soils and groundwater monitoring wells were installed for sampling every five years.

Pennsauken Landfill in Pennsauken, New Jersey. This project, which came online in 2008, utilizes PV panels to produce 2.6 MW of electricity on the site of a closed municipal landfill (Messics 2009). Some key aspects related to development include:

- Majority of waste is bulky and consists of construction and demolition waste.
- Landfill is capped with vegetation, soils and membrane, and the site has groundwater treatment.
- Flatter areas of the landfill were developed; cheaper mounting system and construction costs.
- Grading and earthwork was minimized on older waste where most settlement has already occurred.

Tessman Road Landfill, San Antonio, Texas. This project, which came online in 2009, includes flexible PV solar cells installed directly to the cap to produce 135 kW of electricity on the site of a closed municipal landfill (Sampson 2009). Coupled with landfill gas technology, the site produces 9 MW of electricity. Some key aspects related to development include:

- Geomembrane cover system functions as both an effective landfill cap and mounting surface for flexible PV panels.
- The system covers 5.6 acres of 18-degree south facing slope.
- Exposed geomembrane is securely anchored rather than held in place with soil ballast.

Hull Wind II, Hull, Massachusetts. One turbine, capable of generating up to 1.8 MW, was constructed at a closed landfill site (Manwell et al. 2006). Some key aspects related to development include:

- A geotechnical investigation determined in sufficient detail the characteristics of the landfill and the bedrock underneath it, and that a foundation could be designed.
- Landfill does not have a protective liner. Piles were driven through the landfill to solid rock beneath to support the turbine, instead of waste supporting the turbine.

2.6 MINE SITES

Active and abandoned mine sites may serve as excellent locations for solar or wind energy projects, as the requirements for these facilities and the characteristics of mine lands may be well-suited to each other. Mine sites offer a number of potential advantages over greenfields, including the following:

- **Infrastructure.** Many mine sites have existing infrastructure that is often more economically viable to retrofit than to develop. Mines consume large amounts of energy to extract and distribute raw materials, meaning they often have good energy transmission capacity, proximity to transmission interconnections, and a road network capable of supporting large construction and maintenance vehicles.
- **Terrain.** Flat or terraced topography of mine sites make them suitable for solar or wind development. Tailings dam sites offer a mix of ideal terrain and suitable geology for turbine and solar array foundations.
- **Land acquisition.** Developers can avoid a complicated acquisition process because large mine sites often have one or only a few owners. Contaminated sites may offer certain purchase or lease incentives unavailable on greenfield sites. Coupled with low competing real estate demand, the purchase or lease of mine lands can lower project costs considerably.
- **Industrial zoning.** Renewable energy development is often considered compatible with surrounding land uses if sited on a former or active mine. There is often no time-consuming rezoning process and adjacent landowners may not object to clean energy development.
- **Reciprocal interest.** Mine operators may desire to utilize on-site renewable energy development as a way to meet state renewable portfolio standards or comply with other laws and regulations.
- **Public and community relations.** Developers considering mine sites may receive support or an expedited permitting process from communities eager to repurpose an abandoned or contaminated mine site.

- **Reduced liability programs.** EPA and most state voluntary cleanup programs offer mechanisms for limiting liability.

2.6.1 Technical Aspects

Mine sites may pose unique environmental considerations that may impose restrictions on the type and amount of renewable energy that can be developed on an active or closed mine site. For example, vertical cuts in the land (highwalls) can present a significant danger when in close proximity to structures or roads. Structures built above or below highwalls may be damaged by falling rock, and building near a highwall can also increase safety concerns (ODNR 2008).

Buildings and other such features located on mine spoil may settle, move or have leachate problems. Mine spoil and coal refuse, even if reclaimed, are prone to settlement and are subject to movement by freeze-thaw cycles. Subsidence, in the context of underground mining, is the lowering of the earth's surface due to collapse of bedrock and unconsolidated materials (sand, gravel, salt, and clay) into underground mined areas. Building above abandoned underground mines can cause structural problems if subsidence occurs (ODNR 2008).

The indiscriminate placement of steeply sloped unconsolidated mine spoil, prevalent on abandoned surface mines, can result in landslides that impact existing roads, structures, and streams. Drainage from deep mines and strip mine impoundments can also saturate native soil units on non-mined slopes and result in the instability of these slopes (ODNR 2008).

Impoundments left behind by a mining operation can pose many problems for site development, such as potential flooding problems due to heavy seasonal rains, and saturation of surrounding areas causing hillside instability. Surface and subsurface drainage patterns and flow rates may have been altered as a result of mining practices. This situation may have resulted in increased sediment in streams, which can reduce channel capacity and increased the frequency of flooding. Subsurface drainage can also be impacted by abandoned deep and strip mines (ODNR 2008).

2.6.2 Select Project Profiles

The following examples illustrate siting solar and wind energy facilities on mine sites.

Green Mountain Wind Energy Center located in Somerset County, Pennsylvania. Green Mountain Energy constructed eight 1.3 MW turbines on an abandoned coal strip mine in Pennsylvania. This wind farm was the first utility scale wind energy generation facility developed in the state. Operation began in 2000 and the project produces 10.4 MW (Disgen 2011). A key aspect related to development includes wind farm constructed on reclaimed area of former mining site.

Glenrock Wind Energy Project located in Converse County, Wyoming. Pacific Power has constructed 158 turbines with an output of 237 MW on the site of the old Dave Johnston coal strip mine The project became operational in 2009 (PacifiCorp 2011). Some key aspects related to development include reclamation of the nine-mile-long site involved extensive grading and contouring and reseeding with native vegetation, making the site suitable for wind energy, cattle grazing, and wildlife habitat.

Chevron Solar Project in Questa, New Mexico. The 1 MW Questa solar field covers approximately 20 acres and includes 173 solar trackers. The solar facility is located on the tailing site of a molybdenum mine. The project was completed in April 2011 (Chevron 2011b). Some key aspects related to development include:

- Remediation includes containment of waste rock and tailing source materials, ground water extraction and treatment, temporary ground water restrictions, and provision of alternate water supply, if needed.
- Solar project includes an evaluation of various soil cover depths in preparation for closure of the mill tailings area at the end of mining operations.

2.7 AGRICULTURAL LANDS

With continuing use of incentives to generate renewable energy, developers have demonstrated a preference for marginal and impaired private lands, particularly agricultural parcels that may no longer be economically viable for agricultural production or where land is taken out of farm production for lack of water. They are often attracted to this farmland because of its proximity to existing electricity infrastructure such as transmission lines and substations. The degraded nature of the land may also make it less likely to have significant biological, environmental, or agricultural value that may make the land unsuitable for renewable energy development. Marginal and impaired agricultural land may offer several advantages, including the following:

- **Infrastructure.** Some farmlands are located in close proximity to market centers, transmission interconnections, and other infrastructure, including road networks capable of supporting large construction and maintenance vehicles, which can often be reused for energy project construction, operation, and maintenance.
- **Terrain.** The flat or gently sloping topography of farmlands make them suitable for solar or wind development.
- **Land acquisition.** Developers can avoid a complicated acquisition process because farmlands often have one or only a few owners. The land value for marginal or impaired farmlands can lower project costs considerably. In some states, landowners may benefit from a

reduced property tax assessment if they develop renewable energy on farmland that is impaired either due to physical limitations or adverse soil conditions.

- **Agricultural zoning.** Renewable energy development is often considered compatible with surrounding land uses if sited on former farmland. Projects can often be considered on nonprime agricultural land pursuant to a conditional use permit if accompanied by appropriate mitigation measures. Encouraging renewable energy development on impaired or marginal farmlands directs this development away from prime farmland and environmentally sensitive areas.
- **Reciprocal interest.** Owners of marginal or impaired farmlands may be looking for alternative forms of income.
- **Reduced liability and cleanup costs.** Renewable energy development may require less intensive cleanup efforts than other potential reuses of contaminated agricultural land. In addition, developers may be shielded from liability arising from existing on-site contamination.
- **Public and community relations.** Developers considering marginal or impaired farmlands may receive support or an expedited permitting process from communities eager to utilize these impaired farmlands instead of prime farmland and farmland with environmentally sensitive areas.

2.7.1 Technical Aspects

Site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on marginal or impaired farmlands. For example, smaller sites may not support utility-scale development or certain energy technologies.

Marginal or impaired farmlands may also pose unique environmental considerations, including sensitive habitats adjacent to farmland. Existing farming operations can limit the placement of renewable energy infrastructure.

2.7.2 Select Project Profiles

The following examples illustrate siting solar and wind energy facilities on impaired or marginal farmland sites.

Westlands Solar Park, King County California. The Westlands Solar Park is a master planned infrastructure development in Central California comprising primarily of a 2.7 plus gigawatt (GW) solar park with phased generation development, transmission, and other facilities. The project is proposed on 30,000 acres of land owned by three private landowners and Westlands Water District. Early Phase 1 projects are expected to begin operation as early as 2013-2015 (Westlands 2011). The land includes properties affected by lack of

drainage facilities to remove water runoff containing high levels of selenium. Some key aspects related to development include:

- Project is unique among others in the Central Valley because the land has been given a state designation as a competitive renewable energy zone and the project is unanimously supported by agricultural and environmental organizations.
- Land within the Westlands Solar Park also has the advantage of being under existing transmission, which makes it an ideal location for a large solar park

Project West Wind, Wellington, New Zealand. Meridian is using 62 turbines on marginal farmland to produce 142.6 MW of wind energy (NZWEA 2011). The project was completed in 2009. Some key aspects related to development include:

- The turbines were installed and commissioned in groups, allowing the site to generate increasing amounts of electricity as work progressed.
- The turbines are linked to an on-site substation with underground cabling. From the substation, the wind farm is connected with a short overhead line to a double circuit transmission line.

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SECTION 3
SOLAR AND WIND ENERGY TECHNOLOGY AND DEVELOPMENT CONSIDERATIONS

3.1 SOLAR POWER TECHNOLOGIES

Solar radiation may be harnessed through various technologies and transformed to usable energy, such as heat and electricity. This section examines the large-scale commercial applications of solar energy capture. Two basic solar energy technologies that produce electrical power are CSP systems and PV systems.

3.1.1 Concentrating Solar Power Systems

CSP technologies use mirrors to concentrate sunlight onto receivers that convert it to heat. The thermal energy is then used to drive a generator via steam turbine or heat engine to produce electricity. CSP technologies are the most suitable solar technologies for large utility-scale applications. The three main types of CSP technologies are linear concentrator, dish/engine, and power tower systems. CSP technologies require cooling of the exhaust steam so that it condenses back into water before being heated again into steam. Wet cooling is many times more efficient than dry cooling and uses 500 to 800 gallons of water per megawatt hour (MWh) (Solar Energy Industries Association 2010).

Linear Concentrator Systems

Linear CSP systems use a large field of long, rectangular, U-shaped mirrors tilted toward the sun that capture and focus solar energy onto linear receiver tubes that run along the length of the mirrors. The receiver contains a fluid (oil or water) that is heated by the sunlight and used to boil water in a steam-turbine generator to produce electricity.

The two major types of linear CSP systems are parabolic trough systems and linear Fresnel reflector systems. Parabolic trough systems are the predominant CSP systems currently operating in the US. They use collectors in which the receiver tube is positioned along the focal line of each parabolic mirror. Currently the largest individual trough systems generate 80 MW of electricity.

Array of parabolic troughs at the National Solar Energy Center in Israel. Credit: Sandia National Laboratory

In linear Fresnel reflector systems, the receiver tube is positioned above several flat or slightly curved mirrors that are mounted on tracking structures. In some systems, a small parabolic mirror may be added atop the receiver to further focus the sun's rays.

Dish/Engine Systems

The dish/engine system produces relatively small amounts of electricity (3 to 25 kW) compared to other types of CSP technologies. Dish/engine systems use mirrored dishes (about 10 times larger than a backyard satellite dish) to focus and concentrate sunlight onto a receiver. The receiver is mounted at the focal point of the dish. To capture the maximum amount of solar energy, the dish assembly tracks the sun across the sky. The receiver is integrated into a high-efficiency "external" combustion engine. The engine has thin tubes containing hydrogen or helium gas that run along the outside of the engine's four piston cylinders and open into the cylinders. As concentrated sunlight falls on the receiver, it heats the gas in the tubes to very high temperatures, causing the gas to expand inside the cylinders. The expanding gas drives the pistons. The pistons turn a crankshaft, which drives an electric generator. The receiver, engine, and generator comprise a single integrated assembly mounted at the focus of the mirrored dish.

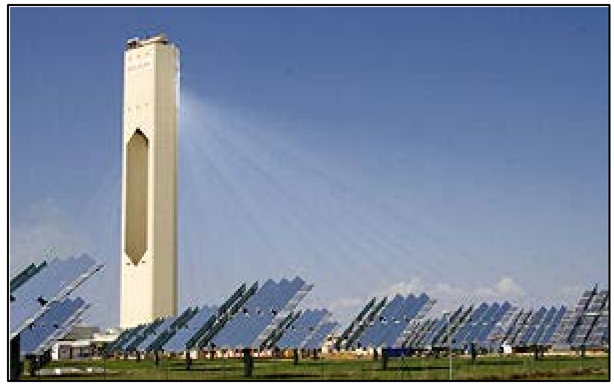
Solar dish/engine system. Credit Solar Energy Development PEIS.

Power Tower Systems

Power tower systems use a large field of flat, sun-tracking mirrors, known as heliostats, to focus sunlight onto a receiver, which is located atop a tower. A fluid in the receiver, either water or molten nitrate salt, is heated and used to generate steam, which, in turn, is used in a conventional turbine generator to produce electricity. The molten nitrate salt has heat-transfer and energy-storage

capabilities, which allows for continued production of electricity during cloudy weather and at night.

3.1.2 Photovoltaic Systems



The PS10 Solar Power Plant (Spain) concentrates sunlight from a field of heliostats onto a central solar power tower. Credit: Solúcar PS10

PV systems use solar cells consisting of semiconductor materials similar to those used in computer chips to capture the energy in sunlight and convert it directly into electricity. PV systems must be scaled over a very large area in order to be effective for utility-scale applications. The process by which a PV cell converts sunlight into electricity is called the photoelectric effect. Through this process, the sunlight absorbed by the semiconductor material knocks electrons loose from their atoms, allowing them to flow through the material and generate electric current.

There are three main types of materials used for solar cells. Traditional solar cells are made from silicon. These cells are usually flat-plate and are the most efficient. The second type is the thin-film solar cell made from amorphous silicon or non-silicon materials, such as cadmium telluride. The third and newest type of solar cell is made from a variety of new materials besides silicon, including solar inks, solar dyes, and conductive plastics. Some new solar cells use plastic lenses or mirrors to concentrate sunlight onto high-efficiency PV materials. These systems are cost effective for use in utility-scale applications because they produce a significant amount of energy using smaller quantities of more efficient, albeit more expensive, materials (NREL 2010).

PV cells are connected into units to form PV modules, which in turn are combined to make PV arrays. The size of an array depends on the amount of sunlight and the needs of the customer. For utility-scale electricity generation, hundreds of arrays are interconnected to form a single large system. Modules and arrays are often combined with other components, such as those that convert the current within the cell material to usable electricity, batteries to store some of the electricity, and mounting structures that point them toward the sun. These components, referred to as the balance-of-system components, combined with modules and arrays create a complete PV system. There are two types of PV systems in use today: flat-plate systems and concentrated PV systems.

Water requirements for PV systems are approximately 20 gallons per MWh for the purpose of cleaning solar panels (Solar Energy Industries Association 2010).

In some operations where water availability is especially limited, a PV operator may choose not to wash the panels at all, eliminating water consumption altogether.

Flat-plate Photovoltaic Systems

The most common array designs use flat-plate PV panels, which can either be fixed in place or allowed to track the sun. These panels respond to both diffuse and direct solar radiation, making them useful even on cloudy days when the diffuse radiation accounts for nearly 100 percent of the total radiation. On a sunny day, an estimated 10 to 20 percent of the total solar radiation comes from the diffuse component of sunlight.

Arizona Public Service's Prescott Airport Solar System Showing a Tracking Flat-Plate, Nonconcentrating PV System. Credit: Arizona Public Service

Generally, flat-plate PV panels are mounted on stationary structures with a tilt at a fixed angle determined by the latitude of the site, the requirement of the load, and the availability of sunlight. The fixed arrays are advantageous in that they are simple, inexpensive, and lightweight. However, because their orientation to the sun is fixed, often at a less than optimal angle, they receive less energy per unit area compared with a tracking array. The flat-plate tracking arrays are primarily mounted on one-axis tracking structures, which are designed to track the sun from east to west.

Concentrated Photovoltaic Systems

Concentrated PV systems use lenses or mirrors to concentrate sunlight on solar cells. The concentration of sunlight allows for greater efficiency and reduction in size and number of cells. These systems must track the sun to keep light focused on the PV cells. They are primarily mounted on two-axis tracking structures, which are designed to track the sun's daily and seasonal course. One-axis tracking systems are also sometimes used.

A 6.2 kilowatt array, part of a solar power plant project in Spain. Credit: SolFocus

Both reflectors and lenses have been used to concentrate light for PV systems. The most promising lens for concentrated PV application is the Fresnel lens,

which uses a miniature saw tooth design to focus incoming light. The best lenses, however, can transmit only 90 to 95 percent, and in practice even less, of incident light. In addition, lenses cannot focus diffuse sunlight, which makes up nearly 10 to 20 percent of the radiation on a clear day.

While concentrated PV systems lower costs by reducing PV material needs, they require sophisticated tracking devices and expensive concentrating optics. High concentration ratios also introduce an excessive heat, which can decrease cell efficiencies and damage solar cells.

3.2 Wind Power Technologies

3.2.1 Technology Overview

A wind turbine is a mechanical assembly that converts the energy of wind into electricity. A wind turbine consists of a blade or rotor, a drive train (usually including a gearbox and a generator), a tower, and other equipment, including controls, electrical cables, ground support equipment, and interconnection equipment. The blades turn in the moving air and power an electric generator that supplies an electric current. The blades act much like an airplane wing. Blowing wind causes a pocket of low-pressure air to form on the downwind side of the blade, which in turn causes the blade to be pulled toward that pocket. This force causes the rotor to spin like a propeller and turn a shaft. The rotational energy of the shaft turns the generator to produce electricity. Wind turbines are mounted on a tower to enable them to capture the most energy. Tower height affects the amount of power that can be extracted by a given wind turbine. At 98 feet or more above ground, wind turbines can take advantage of faster and less-turbulent wind.

Wind turbines near Palm Springs, CA. Credit: Arizona Solar Center

Wind turbines fall into two basic groups, horizontal-axis propeller-style variety, like traditional farm windmills, and vertical-axis design, like the eggbeater-style Darrieus model. The horizontal-axis turbines are the most common, constituting nearly all the utility-scale turbines. These typically have either two or three blades. The three-blade turbines are operated upwind with their blades facing into the wind.

Wind turbines are available in a variety of sizes, and, subsequently, a variety of power ratings. Utility-scale wind turbines for land-based wind farms have rotor diameters ranging from 130 to about 395 feet, and towers that reach 130 to 425 feet high.

Utility-scale turbines range in power rating from 100 kW to as large as several MWs. Larger turbines are grouped together into wind farms, which provide bulk power to a utility power grid. Wind power plants are modular, which means they consist of small individual modules (turbines), and, depending on electricity demand, can easily modify production capacity.

3.2.2 Small and Large Wind Systems

Small scale wind turbines (also known as home or residential wind turbines) can either be connected to the utility grid or stand-alone as an "off-grid" application, normally providing electrical power for home, farm, school, or business applications. Small scale wind machines can have blade length between three feet and 30 feet, with a 100 foot tower, and can power between 1/4 to 6 average American homes (ASU 2011).

Large scale wind turbines (also known as utility wind turbines) are normally tied directly into the utility grid and are used to provide electrical power for entire communities and municipalities. Each of these large, "utility-scale," wind turbines can have blade lengths up to 150 feet and sit on a 200 foot tower, and produce enough electricity for 500 to600 average homes per year (ASU 2011).

3.2.3 Community Wind

Community wind is a growing sector of wind development that increases local energy independence. Community wind projects are owned by a variety of individuals, including local small business owners, farmers, local organizations including schools and universities, as well as Native American Tribes, rural electric cooperatives, municipal utilities, and religious institutions. These projects can range from a single turbine to a community-owned commercial-scale wind farm.

Rural landowners who possess windy land currently benefit from the wind resource primarily by leasing their land to large wind developers who sell the wind energy. Others have installed their own wind turbines, individually or through local small businesses, including farms, and local organizations such as schools, universities, Native American Tribes, rural electric cooperatives, municipal utilities, and even religious institutions. These projects keep more dollars in local communities, preserve local energy independence, and protect the environment.

The key feature of community wind is that local community members own and have a significant financial stake in the project beyond just land lease payments and tax revenue. Community wind projects can be any size, ranging from a single turbine to more than one hundred, yet typically serve local communities

or consumers. Community wind projects have been installed throughout the country and are in the planning stages in virtually every state with wind power development underway.

3.3 Solar and Wind Power Plant Development Considerations

3.3.1 Development Considerations Common to Solar and Wind Plants

Site Characterization

Solar and wind power generation depends on selecting a suitable site. Many different factors determine whether a particular site warrants consideration for potential solar or wind power generation. Once a preliminary screening is completed, as in the RDEP Solar and Wind Site Assessments (Sections 4 and 5), developers will want to conduct more detailed research before committing to project construction and operation. Steps to undertake may include resource surveys (e.g., rare plants, biological, or cultural surveys), soil studies, surface hydrology and wetlands mapping, and microsite meteorological testing. Developers will also want to calculate the cost necessary to construct access roads (if necessary) and consider any compatibility issues with surrounding land uses. Finally, power purchase agreements (PPA) and transmission grid interconnection are critical financial aspects of any project and will vary by location.

Overall, developers are looking for a site that can generate revenue. According to Steve Birndorf (Borrego Solar), developers look for areas where regulatory and funding programs are in place to encourage development of projects (Birndorf 2011). Having these types of programs in place help expedite the process and can provide financial incentives to ensure the project is economically feasible. Developers also look for other features such as flat land, nearby transmission connections, older disturbed lands, and good solar or wind potential. These factors ultimately determine the costs associated with development and influence a developer's return on investment.

Land Agreements

Solar and wind developers need to work with the land owner(s) to determine the nature of the contractual relationship between land owner and developer. Issues to be agreed upon include: ingress and egress rights, transmission rights, compensation terms, project life, and reclamation provisions at project end. The terms need to include reasonable access for solar or wind resource assessment, construction, operation, maintenance and reclamation activities. Compensation can be in the form of a fixed lease fee per acre, fixed fee per kWh or a percentage of gross revenue attributable to the landowner's parcel.

Environmental Review

Additional compliance with NEPA is required for any project with a federal nexus, such as construction on federal land, transmission line siting on federal land, federal funding (e.g., DOE Loan Guarantee Program), or interconnection

with the federal grid (e.g., Western Area Power Administration). Depending on the level of review required and the potential for sensitive species, the developer must undertake, at its cost and, as required, studies of threatened and endangered species, land disturbance, and wetlands and a review of the results of consultation with interested local, state or federal officials, and interested citizens or citizen groups. They may also be required to perform historical and archeological studies and visual impact studies.

Permitting

Permitting requirements to construct and operate a solar or wind plant vary widely depending upon who owns the land and any federal, state, or local restrictions on land use. Typically, land use permits and building permits are the minimum required for solar and wind plants.

Site Preparation and Construction

Once a developer has committed to a project on a specific site, the site must be prepared for construction. This includes constructing access roads as necessary, clearing, and grading. Depending on the amount of site modification needed, the types of heavy construction equipment and the scope of their use will vary.

Many sites are subject to local noise and construction ordinances, which must be adhered to. Also, the developer may be required to carry out detailed, comprehensive resource surveys or have a qualified specialist on site to monitor site preparation and construction activities.

The type and amount of vehicles used to transport workers and equipment may require the preparation of a transportation plan and best management practices to limit impacts on traffic and road systems.

Transmission Lines

To minimize land use impacts and control costs, developers desire project sites that are in close proximity to the existing electric transmission grid. The power from a wind or solar project needs to be delivered to the grid at an approved interconnection point (typically a new or existing substation). Acquiring a route for the interconnection circuits will involve the negotiation of ROW from one or more landowners, plus permitting and construction costs.

New interconnection circuits are expensive, with costs depending on the voltage level, the types of terrain and associated land uses along the interconnection route, and whether or not a portion of the installation is underground. Transmission line costs can be very high, and access to transmission lines of appropriate capacity is a very important siting factor. Depending on the line voltage level and the length of the transmission line, costs for a 100-MW capacity, for example, can range from $50,000 to $180,000 per mile (DOE 2008). Therefore, the proximity of potential solar and wind sites to transmission lines is very important. Consequently, relatively small projects are normally built near existing transmission facilities, while larger projects can

justify the costs of interconnection at greater distances from existing transmission. Purchasing capacity at an existing substation, rather than constructing a new substation, can lower project costs. As such, sites with close proximity to existing substations may be more desirable.

Transmission line preparation and construction will require surveys, staking, clearing, access, and the use of heavy construction equipment.

Water Use and Availability

Arizona has five Active Management Areas, located in regions with a heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code and management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

Interconnection and Wheeling

Utilities, private companies or power marketing administrations with transmission systems must allow solar and wind plants to interconnect to their transmission systems; however, the requirements that must be met, the studies to be undertaken, and the interconnection equipment that will be required are determined by the transmission-owning entity, where the costs are usually borne by the developer. Studies such as capacity limitations, load flow analysis, voltage controls and system protection are the norm. Recent legislation has caused the rules and requirements to be re-visited and standards for interconnection equipment and timelines have been developed for two classes of generation–20 MW or less, or greater than 20 MW.

Moving the solar or wind generated energy to the purchaser of the energy through the utility or other entity owned transmission system is called wheeling. The fee for this wheeling may be determined through negotiation or defined by a tariff filed by state or federal regulators.

In June 2007, the ACC initiated a rulemaking process to establish statewide interconnection standards for distributed generation. This proceeding is still in progress; however, the commission has recommended that the utilities use the *Interconnection Document* as a guide. This document applies to systems up to 10 MW in capacity (DOE 2011a).

The state's utilities independently developed interconnection agreements for distributed generation prior to the ACC's ongoing proceeding to establish statewide standards. The Salt River Project (SRP), which is not regulated by the ACC on utility matters, developed distributed generation interconnection guidelines and an interconnection agreement based on draft rules and a report released by the ACC in 1999 and 2000, respectively. Tucson Electric Power and Arizona Public Service have similarly established their own interconnection procedures for distributed generation systems. It is likely that Arizona's

regulated utilities will adopt the ACC's interconnection standards when the final rules are adopted (DOE 2011a).

Net Metering

In Arizona, net metering is available to customers who generate electricity using solar, wind, hydroelectric, geothermal, biomass, biogas, combined heat and power, or fuel cell technologies. The ACC has not set a firm kW-based limit on system size capacity; instead, systems must be sized to not exceed 125 percent of the customer's total connected load. If there is no available load data for the customer, the generating system may not exceed the customer's electric service drop capacity. SRP modified an existing net-metering program for residential and commercial customers in October 2009. Net metering is now available to customers who generate electricity using PV, geothermal, or wind systems up to 100 kW in alternating current peak capacity.

Power Purchase Agreement

The solar or wind developer must find a buyer for the energy to be generated in order to obtain project financing as the buyer determines the potential revenue stream amount and time frame. The PPA defines the terms for this long term revenue stream. A creditworthy buyer is necessary to ensure a predictable long term cash flow for project financing approval.

Financing and Incentives

With the PPA in hand, the solar or wind developer can work with financiers to determine the terms of the loans, due diligence and assignability of documents. The financing is typically used to provide for the solar collectors, and power generation systems (e.g. turbines) procurement and construction/installation costs though other project costs may also be included.

Identifying and leveraging federal, state and utility incentives and grants is an important part of making solar and wind energy systems cost-effective. A number of policies and incentives are available to facilitate the development of energy projects. The DOE Database of State Incentives for Renewables & Efficiency provides a comprehensive database of information on state, local, utility, and federal incentives and policies that promote renewable energy and energy efficiency (http://www.dsireusa.org/). Select federal and state programs include:

Federal Incentives and Grants

- **Modified Accelerated Cost Recovery Program.** Under the federal Modified Accelerated Cost-Recovery System, businesses may recover investments in certain property through depreciation deductions. The system establishes a set of class lives for various types of property, ranging from three to 50 years, over which the property may be depreciated. A number of renewable energy technologies are classified as five-year property (26 USC Section 168(e) (3) (B) (vi)) under the system, which refers to 26 USC

Section 48(a) (3) (A), often known as the energy investment tax credit or Investment Tax Credit to define eligible property (IRS 2011).

- **DOE Loan Guarantee Program.** DOE can issue loan guarantees to mitigate the financing risks associated with clean energy projects (DOE 2011b).
- **Tribal Energy Grant Program.** The DOE Tribal Energy Program promotes tribal energy sufficiency, economic growth and employment on tribal lands through the development of renewable energy and energy efficiency technologies. The program provides financial assistance, technical assistance, education and training to tribes for the evaluation and development of renewable energy resources and energy efficiency measures (DOE 2011c).
- **Renewable Energy Production Incentive.** Established by the federal *Energy Policy Act of 1992*, the federal Renewable Energy Production Incentive provides incentive payments to qualified tax-exempt entities for electricity generated and sold by new qualifying renewable energy facilities. Qualifying systems are eligible for annual incentive payments of 1.5 cents per kWh in 1993 dollars (indexed for inflation) for the first 10-year period of their operation, subject to the availability of annual appropriations in each federal fiscal year of operation. The incentive was designed to complement the federal renewable energy production tax credit, which is available only to businesses that pay federal corporate taxes (DOE 2011d).

State Incentives

- **Arizona Renewable Energy Standard and Tariff.** In 2006, the ACC approved the Renewable Energy Standard and Tariff (REST). These rules require that regulated electric utilities must generate 15 percent of their energy from renewable resources by 2025. Each year, Arizona's utility companies are required to file annual implementation plans describing how they will comply with the REST rules. The proposals include incentives for customers who install solar energy technologies for their own homes and businesses (ACC 2011).
- **Renewable Energy Production Tax Credit.** Qualified renewable energy systems installed on or after December 31, 2010, may be eligible for the tax credit based on the amount of electricity produced annually for a 10-year period (DOE 2011d).
- **Solar Energy Equipment Sales Tax Exemption.** Arizona provides state tax incentives for the sale or installation of "solar energy devices," as these devices are defined within the Arizona Revised Statutes. Transaction privilege ("sales") tax exemptions apply to retail sales of solar energy devices, and installations of such

devices under the prime contracting classification. Applies to solar energy devices and any other device or system designed for the production of solar energy for onsite consumption (ASC 2011).

Operation and Maintenance

The solar or wind developer must include provisions for operations and maintenance for financing because it is critical to the successful long-term operation of the solar plant or wind turbine. The operations and maintenance terms typically specify a solar plant or wind turbine availability percentage (usually 95 to 98 percent of the year) and outline the nonperformance penalties (DOE 2008).

3.3.2 CSP Plant Development Considerations

Solar Resource

The amount of power generated by a CSP plant depends on the amount of direct sunlight. These technologies use only direct-beam sunlight, rather than diffuse solar radiation. The southwestern US potentially offers the best development opportunity for CSP technologies in the world.

Land

A parabolic trough solar power plant requires approximately five acres (20,000 m^2) per MW of plant capacity. Plants with thermal storage and higher capacity factors will require proportionally more land per MW. Siting studies have generally found that land with an overall slope of less than one percent are the most economical to develop (DOE 2008). Potential sites should have reasonable land costs, be generally level, and be close to transmission, water, and natural gas. The specific slope and topography of the land will then determine the comparative acceptability of competing sites through their impact on site costs for grading and preparation. Land characteristics are thus most effectively used as screening tools in selecting acceptable sites for further evaluation.

Water

The primary water uses at a Rankine steam solar power plant are for the steam cycle, cooling, and washing mirrors. Historically, parabolic trough plants have used wet cooling towers for cooling. The cooling uses approximately 90 percent of the water. The steam cycle uses approximately eight percent and mirror washing uses the remaining two percent (DOE 2008).

Annual water consumption at trough plants is approximately 750 acre-feet for a 100 MW plant (DOE 2008). If sufficient water is not available for cooling, either dry cooling or wet-dry systems are necessary. These options can increase plant electricity costs by 10 percent or more, indicating the desirability of sites with sufficient aquifer or other water resources. Treatment of raw water is required for plant use.

Natural Gas

Solar thermal power plants have the capacity to provide firm power in a hybrid configuration where fossil fuel, preferably natural gas, can supplement the solar energy resource. This is particularly important during peak demand periods where electricity's value is high. If power firming is a requirement of the power buyer, proximity to natural gas pipelines is a very important factor. It is a significant, though usually not critical, determinant in the viability of hybrid operation. Very large distances can make this option economically unacceptable.

3.3.3 PV Plant Development Considerations

Solar Resource

Concentrating PV systems require high direct normal irradiance (DNI), or beam radiation, for cost-effective operation. Flat-plate, non-concentrating PV systems use global diffuse solar radiation, which includes the DNI and scattered blue-sky light. Generally, under clear sky conditions, 85 percent of the sunlight is DNI and 15 percent is scattered light that comes in at all different angles (DOE 2008). The scattered light, which cannot be used by any concentrating system, can be used by flat-plate PV systems. Sites that have a good solar resource for concentrating systems are also great for flat-plate systems, since the global solar resource includes the DNI.

Land

All large PV systems require fairly flat land with slopes of less than three percent. The slope of the land has an impact on construction costs. PV power plants require a large area for their solar collector field. Approximately five acres are required per MW of electricity produced in a PV power plant.

Water

Water is not required for the normal operation of any PV system. Water is used chiefly for occasional cleaning of the PV modules, Fresnel covers, or the reflective surfaces. The washing interval is determined by local site conditions and an economic analysis of cleaning costs versus increased energy production. Cleaning flat-plate PV systems can be as simple as driving a water truck between the rows and spraying the PV modules. Many installations are not regularly cleaned due to cost, and rely on wind and rain to keep the modules sufficiently clean.

3.3.4 Wind Power Plant Development Considerations

Wind Resource

A wind project's energy production and life-cycle economics depend more on the strength of the wind resource than any other factor. Therefore developers must seek windy locations when prospecting for potential development sites. A rule-of-thumb is that a site's annual average wind speed should be 15.7 miles per hour (mph) or stronger at the wind turbines' hub height to be considered at least marginally attractive for project development (GEC undated). Other

project cost variables may require stronger average winds in order to realize economic viability.

Land

In general, land requirements for wind power projects vary considerably and mostly depend on two sets of factors. The first set pertains to the developer's goals in terms of preferred windy locales and desired project size or power capacity (i.e., number of turbines). Larger projects naturally require more land area, and larger projects also tend to yield lower costs of energy due to economies of scale.

The second set of factors pertains to local landform characteristics and existing patterns of land use and land ownership. Various landforms, including high-plains, valley floors, hills, ridges, plateaus, and mountains have differing exposures to prevailing wind conditions. They also offer differing wind power project siting opportunities. For example, only the tops of ridges are practical sites for wind turbines due to superior wind exposure, whereas high-plains can experience similar wind conditions across a broad area. Accordingly, land requirements for a wind power project will vary depending on the landform type. Even after a given landform is identified, other factors such as land ownership patterns, land use, and land cover patterns will influence how a wind project is ultimately designed and how much land is ultimately required.

Wind Turbine Transportation and Installation Issues

Due to the ever increasing size of wind turbines, such as 80 to100 meter hub heights, transporting wind turbines is increasing in cost. Turbine tower sections are large diameter, as long as possible, and extremely heavy for transport by specialized trucking equipment to the site. The same is true for the turbine hub and blades in excess of 70 meters. Trucking equipment require large turning radius, so site access may require road improvement to delivery turbine components. An additional consideration for installation of large wind turbines is the cost and availability of large cranes in the vicinity of the wind farm site.

Soil conditions must be favorable for road construction and for installing underground facilities such as wind turbine foundations, fiber-optic communication lines, and electrical conductors. All of these factors have cost and land use implications and are therefore an important consideration when evaluating prospective project sites.

3.4 SOLAR AND WIND POWER PLANT TRENDS

3.4.1 US Grid-Connected Solar Market Trends

PV Technology

Annual US grid-connected PV installations doubled to 890 MW in 2010 compared with installations in 2009 (IREC 2011). The following factors helped drive PV growth in 2010:

- Stability in federal incentive policy.
- Capital market improvements.
- State renewable portfolio standards requirements encouraging investments in utility-scale solar plants.
- State financial incentives, including commercial distributed installations.
- Continued federal stimulus funding.
- Decline in PV module prices.

The largest growth of grid-connected PV occurred in the utility sector. Utility sector photovoltaic installation quadrupled over 2009 installations (15 to 32 percent). Of the 10 largest PV installations in the US, six were installed in 2010. The two largest US PV installations were installed in 2010 (58-MW Sempra/First Solar plant in Boulder City, Nevada and 35-MW Southern Company/First Solar plant in Cimarron, New Mexico).

State renewable portfolio standards requirements are encouraging investments in utility-scale solar plants in some states. Federal tax incentives and grants and lower costs for PV modules also made these investments attractive. Construction has begun on many additional utility sector installations, and utilities and developers have announced even more projects to be built in the next few years. Installations in this sector seem poised for continued growth (IREC 2011).

Although the number of utility PV installations remains small, the average system size is large (over 1.45 MW). These installations represent 32 percent of all installations on a capacity basis. Only 34 utility installations greater than 1 MW totaled 239 MW, or 27 percent of the capacity total of US systems installed in 2010 (IREC 2011). In 2009, just six such installations totaled 60 MW. Large utility installations attract significant attention, but small installations also occur in the utility sector. The average size of grid-connected PV installations varies from state-to-state, depending on available incentives, interconnection standards, net metering regulations, solar resources, retail electricity rates, and other factors.

In 2010 Arizona had 63.6 MW of grid-connected PV capacity installed, a 201 percent change from 2009 which saw 21.1 MW of capacity installed. Cumulatively (through 2010), Arizona has the fourth largest amount of installed grid-connected PV capacity (110 MW) (IREC 2011).

CSP Technology

In 2010 the demand for CSP was insignificant. However, there are several very large projects underway in California and Arizona. Major CSP development highlights in Arizona include the Solana project (250 MW) scheduled to be

completed in 2012, and the University of Arizona Tech Park project (5 MW) scheduled to be completed in 2011.

Between 2011 and 2016, GBI Research forecasts that utility-owned or sponsored CSP capacity additions in the US will approach 6,360 MW, led by the likes of Southern California Edison (2,500 MW projected), Pacific Gas & Electric (1,600 MW), NV Energy (800 MW), San Diego Gas & Electric (700 MW), and Arizona Public Service (600 MW), among others (Solar ETC 2011).

CSP has some legitimate advantages on PV at scale that are winning over wavering utilities. Higher capacity factors allow CSP plants to produce more power per MW installation, and output of PV in the desert drops due to factors like extreme heat, losing as much as 15-20 percent productivity for a crystalline silicon panel (Solar ETC 2011). CSP also offers efficiency rates that solve intermittency problems that utilities fear with other renewables. However, there is greater uncertainty with the future growth of CSP technology in the US due to financing, permitting, water use, and environmental approvals because of the large land requirements for this type of technology. Because of these uncertainties, the progression of CSP projects is not at all as clear as it was in 2010 (CSP Today 2011).

3.4.2 US Wind Market Trends

Installation Trends

The US wind power market slowed in 2010, with 5,113 MW of new capacity added, bringing the cumulative total to more than 40,000 MW (DOE 2011e). Through 2010, Arizona had cumulative total of 128 MW of utility-scale wind power (AWEA 2011). Wind power installations in 2010 were similar in magnitude to those recorded in 2007; however, installations were just half those seen in 2009 and were 40 percent lower than in 2008. Cumulative wind power capacity grew by 15 percent in 2010. Factors slowing growth in 2010 included: the delayed impact of the global financial crisis (which impacted the apparent availability of capital for 2010 projects that were being planned in 2009); relatively low natural gas and wholesale electricity prices, which, in part, inhibited the development of merchant projects that were more-common in previous years; and slumping overall demand for energy, which reduced utility demand for wind energy power purchase agreements.

More than 20 MW of small wind turbines (100 kW and less in size) were sold in the US in 2009. These installation figures represent a 15 percent growth (in terms of capacity) in annual sales relative to 2008, yielding a cumulative installed capacity of small wind turbines in the US of roughly 100 MW by the end of 2009 (AWEA 2010). Within this market segment, there has been a trend towards larger, grid-tied systems. Sales of turbines less than1 kW in size (often used off-grid) were flat from 2006-09 at roughly 3 MW. Sales of 1 to 10 kW turbines (often used in the grid-tied residential market), on the other hand, grew from

less than 2 MW in 2006 to 8 MW in 2009, while sales of 11 to 100 kW turbines (often used in the grid-tied commercial, light industrial, and government market) grew from around 3 MW in 2006 to almost 10 MW in 2009 (AWEA 2010). Growth in this sector has been driven, at least in part, by a variety of state incentive programs (refer to **Section 3.3.1**, Development Considerations Common to Solar and Wind Plants, for a discussion of select Arizona incentive programs). In addition, wind turbines equal to or under 100 kW in size are eligible for an uncapped 30 percent federal investment tax credit.

Future Outlook

With federal incentives for wind energy in place through 2012, an improved project finance environment in 2010 and early 2011, and lower wind turbine and wind power pricing, modest growth in annual wind power capacity appears likely in 2011 relative to 2010. Additions are expected to remain well below the 2009 high, however, due in part to relatively low wholesale electricity prices and limited need for new electric capacity additions, which are likely to reduce merchant wind power development and utility demand for wind energy PPAs, and in part to existing state-level renewable portfolio standards programs that, in aggregate, are not sizable enough to support continued wind power capacity additions at 2008 and 2009 levels. A variety of forecasts suggest that wind power installations in 2011 may fall within the range of 4,450 MW to 8,000 MW, substantially below the 2009 high of 9,993 MW.

The DOE suggests four other areas where supportive actions may be needed in order to reach such annual installation rates. First, the nation will need to invest in significant amounts of new transmission infrastructure designed to access remote wind resources. Second, to more effectively integrate wind power into electricity markets, larger power control regions, better wind forecasting, and increased investment in fast-responding generating plants will be required. Third, siting and permitting procedures will need to be designed to allow wind power developers to identify appropriate project locations and move from wind resource prospecting to construction quickly. Finally, enhanced research and development efforts in both the public and private sector will be required to lower the cost of offshore wind power and incrementally improve conventional land-based wind energy technology (DOE 2011e).

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SECTION 4
SOLAR SITE ASSESSMENT

The following site assessment evaluates the suitability of CSP and PV solar technologies on the 64 nominated sites. Results of the solar assessments are provided in **Table 4-1**, Solar Potential Screening Results.

The general goal of the analysis is to provide a preliminary assessment of the overall potential for developing solar energy on each of the nominated sites. As discussed below, several criteria were developed to inform the preliminary assessment. These include slope, solar resource availability, distance to transmission lines, interconnections and roads, and the presence of sensitive resources and/or potentially incompatible land use designations. This analysis provides a first-level screening to identify areas that merit further scrutiny for solar resource development.

4.1 SOLAR POWER CRITERIA DEVELOPMENT

The assessment adhered to a specific methodology outlined below. BLM utilized screening criteria based on past methodology developed by National Renewable Energy Laboratory (NREL) (DOE 2008) and adapted for specific issues and concerns with public land management, previously disturbed sites, and environmental conditions in Arizona. **Section 6**, References and Data Sets for GIS Screening, describes the data in further detail. The BLM reviewed high-potential site screening criteria from previous federal land renewable resource assessments. The screening criteria are presented in **Section 4.2**, Solar Power Assessment Methodology.

4.1.1 Utility and Distributed Generation

Solar energy projects can be categorized as utility or distributed, depending on several factors. Utility generation, also known as large-scale generation, ties into the power grid for distribution to off-site markets. As such, they are generally larger in capacity and can be located away from load centers. Distributed or small-scale generation produces power often used on-site or nearby. These

projects may not require transmission interconnection and the on-site or close proximity power consumption usually dictates that these projects be located near a load center.

The site profiles identify those sites within 10 miles of a load center as potential candidates for distributed or central generation projects. All other sites are noted for their potential suitability for central generation.

4.2 Solar Power Assessment Methodology

Based on the review of potential assessment criteria, the following site characteristics and methodology were used to assess the suitability of a site for solar power energy development. This analysis does not differentiate between CSP and PV technologies. However, because available technology currently requires a large land area to be commercially viable, sites less than 100 acres are noted in the site profiles (see **Section 7**, Nominated Site Profiles) for their possible incompatibility with large-scale or central CSP projects.

4.2.1 Slope

Utilization of current solar development technology is limited to areas with a slope of five percent or less. For this assessment, sites where 100 percent of the land exhibits less than five percent slope receive 10 points, 90 to 99 percent receive 9 points, 80 to 89 percent receive 8 points, 70 to 79 percent receive 7 points, 60 to 69 percent receive 6 points, 50 to 59 percent receive 5 points, 40 to 49 percent receive 4 points, 30 to 39 percent receive 3 points, 20 to 29 percent receive 2 points, 10 to 19 percent receive 1 point, and 0 to 9 percent receive 0 points.

The weight factor of the slope in the overall scale is 25 percent.

4.2.2 Direct Solar Resource

CSP and PV technologies become viable at different direct solar resource intensities. PV systems require 5 $kWh/m^2/day$, but a level of 6.5 $kWh/m^2/day$ is necessary for CSP systems. Because all of the sites measure greater than 6.5 $kWh/m^2/day$, the solar resource rating is considered adequate for all of the nominated sites and all sites score the maximum 10 points.

The weight factor of solar resource ratings in the overall scale is 30 percent.

4.2.3 Distance to Transmission/Interconnections

The presence of transmission lines/interconnections in close proximity to the site lowers the time and cost necessary for site development. Values were assigned according to the sites' distance from existing transmission lines (ranging between 69-500 kilovolts [kV]). Sites less than or equal to five miles from transmission lines were assigned 10 points; 8 points for sites 6 to 10 miles; 6 points for sites 11 to 15 miles; 4 points for sites 16 to 20 miles; and 2 points for sites 21 to 25 miles. Sites located more than 25 miles from the nearest 69-500 kV line received 0 points.

The weight factor of distance to transmission line in the overall scale is 15 percent.

4.2.4 Distance to Roads

The presence of graded roads in close proximity to the site lowers the time and cost necessary for site development. Values were assigned according to the sites distance from graded roads. Sites less than 1 mile from graded roads were assigned 10 points; 8 points for sites 1 to 5 miles; 6 points for sites 6 to 10 miles; 4 points for sites 11 to 15 miles; and 2 points for sites 16 to 20 miles. Sites located more than 20 miles from the nearest graded road received 0 points.

The weight factor of distance to graded roads in the overall scale is 15 percent.

4.2.5 Sensitive Resources and Land Management

The presence of sensitive resources or incompatible land management designations can increase time and cost necessary to develop a site or prohibit development altogether. The nominated sites were screened for 12 criteria: Arizona Game and Fish Department (AZGFD) Species and Habitat Conservation Guide Conservation Potential, AZGFD big game habitat, AZGFD wildlife corridors, special status species habitat (including threatened and endangered species habitat), desert tortoise habitat, mapped wetlands, 100-year floodplains, sensitive soils, mining claims, access, adjacent land uses, and right-of-ways (ROW). In addition, sites located on BLM-administered land were screened for Visual Resource Management (VRM) Class I, II, and III classification; Special Recreation Management Area (SRMA) designation; and ROW exclusion or avoidance designations.

Site-specific information on cultural resources is not available for the nominated sites. BLM would comply with the National Historic Preservation Act (NHPA) in considering any applications to develop energy facilities on nominated sites on BLM-administered or leased land. Class I inventories (data searches) and, if needed, Class III field inventories would be conducted to identify any affected cultural resources. Most of the nominated sites have been disturbed to the extent that they likely do not contain intact cultural resources; this is particularly true for landfills and mines. In some cases, impacts to cultural resources may have been mitigated prior to the development of these facilities.

However, relatively undisturbed nominated sites or former agricultural areas could contain cultural resources or intact archaeological deposits. Historic mining features could be associated with modern mines. Potential effects on cultural resources in adjacent areas, or tribal concerns such as visual impacts or access issues relating to places of traditional importance, could raise issues that would need to be addressed through the Section 106 of the NHPA consultation process.

Developers will need to consult with the relevant agencies to determine the effect a criterion will have on their project; thus, the presence of one or more criterion is simply an indicator that additional consultation will likely be required.

Sites with 0 criteria received 10 points, sites with 1 criterion received 8 points, sites with 2 criteria received 6 points, sites with 3 criteria received 4 points, sites with 4 criteria received 2 points, and sites with 5 or more criteria received 0 points.

The weight factor of sensitive resources in the overall scale is 15 percent.

4.3 RESULTS

Table 4-1, Solar Potential Screening Results, shows the scoring of each nominated site by criterion and by total score.

Table 4-1
Solar Potential Screening Results

Site		Characteristics Inputs					Criteria Evaluation Values					Weighted Scores per Criteria					Total Score (out of 100)
		Slope (% of site exhibiting <5% slope)	Direct Solar Resource (kWh/m^2/day)	Distance to Transmission (Miles)	Distance to Road (Miles)	Sensitive Resources and Land Management (# of sensitive resources)	Slope	Direct Solar Resource	Distance to Transmission	Distance to Road	Sensitive Resources and Land Management	Slope (25%)	Direct Solar Resource (30%)	Distance to Transmission (15%)	Distance to Road (15%)	Sensitive Resources and Land Management (15%)	
1	19th Street Landfill	98	6.5	1	<1	3	9	10	10	10	4	22.5	30	15	15	6	**88.5**
2	Belmont CAP	99	6.5	5	<1	3	9	10	10	10	4	22.5	30	15	15	6	**88.5**
3	Belmont Proposed Disposal	96	6.5	0	1	4	9	10	10	8	2	22.5	30	15	12	3	**82.5**
4	Black Canyon City Landfill	100	6.5	0	<1	3	10	10	10	10	4	25	30	15	15	6	**91**
5	Black Rock Gypsum Mine	31	6.5	0	<1	2	3	10	10	10	6	7.5	30	15	15	9	**76.5**
6	Bouse Hills CAP	78	6.5	8	<1	1	7	10	8	10	8	17.5	30	12	15	12	**86.5**
7	Brady Central CAP	100	6.5	7	1	3	10	10	8	8	4	25	30	12	12	6	**85**
8	Brady Wash Pipeline	71	6.5	5	1	7	7	10	10	8	0	17.5	30	15	12	0	**74.5**
9	Butler Valley	98	6.5	0	1	2	9	10	10	8	6	22.5	30	15	12	9	**88.5**
10	Cave Creek 2	100	6.5	0	1	2	10	10	10	8	6	25	30	15	12	9	**91**
11	Cave Creek Landfill	100	6.5	1	1	3	10	10	10	8	4	25	30	15	12	6	**88**
12	Chevron Vacant Land	97	6.5	0	3	6	9	10	10	8	0	22.5	30	15	12	0	**79.5**
13	Christmas Mine	0	6.5	5	<1	4	0	10	10	10	2	0	30	15	15	3	**0**
14	Copperstone Mine	81	6.5	9	<1	3	8	10	8	10	4	20	30	12	15	6	**83**
15	Cordes Lakes Hazmat	14	6.5	1	<1	5	1	10	10	10	0	2.5	30	15	15	0	**62.5**
16	Dateland Gravel Pit	41	6.5	1	<1	1	4	10	10	10	8	10	30	15	15	12	**82**
17	Detrital Wash	95	6.5	0	<1	2	9	10	10	10	6	22.5	30	15	15	9	**91.5**
18	Dog Town Mine	91	6.5	0	<1	4	9	10	10	10	2	22.5	30	15	15	3	**85.5**

Table 4-1
Solar Potential Screening Results

Site		Characteristics Inputs					Criteria Evaluation Values					Weighted Scores per Criteria					Total Score (out of 100)
		Slope (% of site exhibiting <5% slope)	Direct Solar Resource (kWh/m²/day)	Distance to Transmission (Miles)	Distance to Road (Miles)	Sensitive Resources and Land Management (# of sensitive resources)	Slope	Direct Solar Resource	Distance to Transmission	Distance to Road	Sensitive Resources and Land Management	Slope (25%)	Direct Solar Resource (30%)	Distance to Transmission (15%)	Distance to Road (15%)	Sensitive Resources and Land Management (15%)	
19	Empire Farms	100	6.5	0	<1	2	10	10	10	10	6	25	30	15	15	9	**94**
20	Florence-Price Dump	100	6.5	0	<1	5	10	10	10	10	0	25	30	15	15	0	**85**
21	Foothills Proposed Disposal	55	6.5	0	<1	3	5	10	10	10	4	12.5	30	15	15	6	**78.5**
22	Forepaugh Airport	100	6.5	0	<1	2	10	10	10	10	6	25	30	15	15	9	**94**
23	Fredonia Landfill	86	6.5	4	<1	3	8	10	10	10	4	20	30	15	15	6	**86**
24	Fredonia OHV Area	49	6.5	3	<1	4	4	10	10	10	2	10	30	15	15	3	**73**
25	Granite Hill Landing Strip	91	6.5	4	<1	4	9	10	10	10	2	22.5	30	15	15	3	**85.5**
26	Harcuvar Substation	100	6.5	0	<1	3	10	10	10	10	4	25	30	15	15	6	**91**
27	Harquahala CAP	100	6.5	0	<1	0	10	10	10	10	10	25	30	15	15	15	**100**
28	Harrison Road	15	6.5	6	<1	4	1	10	8	10	2	2.5	30	12	15	3	**62.5**
29	Hartman Wash Mine	1	6.5	1	1	7	0	10	10	8	0	0	30	15	12	0	**57**
30	Hassayampa Landfill	89	6.5	3	<1	2	8	10	10	10	6	20	30	15	15	9	**89**
31	Hassayampa CAP	99	6.5	0	<1	1	9	10	10	10	8	22.5	30	15	15	12	**94.5**
32	Irvington	69	6.5	6	1	2	6	10	8	8	6	15	30	12	12	9	**78**
33	Jones Private Property	100	6.5	13	<1	3	10	10	6	10	4	25	30	9	15	6	**85**
34	La Osa Surface Disturbance	100	6.5	1	<1	4	10	10	10	10	2	25	30	15	15	3	**88**
35	Litchfield Park Urban Parcel	100	6.5	0	<1	1	10	10	10	10	8	25	30	15	15	12	**97**

Table 4-1
Solar Potential Screening Results

Site		Characteristics Inputs					Criteria Evaluation Values					Weighted Scores per Criteria					Total Score (out of 100)
		Slope (% of site exhibiting <5% slope)	Direct Solar Resource (kWh/m²/day)	Distance to Transmission (Miles)	Distance to Road (Miles)	Sensitive Resources and Land Management (# of sensitive resources)	Slope	Direct Solar Resource	Distance to Transmission	Distance to Road	Sensitive Resources and Land Management	Slope (25%)	Direct Solar Resource (30%)	Distance to Transmission (15%)	Distance to Road (15%)	Sensitive Resources and Land Management (15%)	
36	Little Harquahala CAP Site	82	6.5	4	<1	3	8	10	10	10	4	20	30	15	15	6	**86**
37	Los Reales	91	6.5	3	<1	3	9	10	10	10	4	22.5	30	15	15	6	**88.5**
38	Mobile Proposed Disposal	98	6.5	0	<1	2	9	10	10	10	6	22.5	30	15	15	9	**91.5**
39	Mokaac Gravel Pit	98	6.5	0	<1	3	9	10	10	10	4	22.5	30	15	15	6	**88.5**
40	Old Yuma County FUP	96	6.5	2	<1	2	9	10	10	10	6	22.5	30	15	15	9	**91.5**
41	Page Landfill	100	6.5	0	<1	1	10	10	10	10	8	25	30	15	15	12	**97**
42	Prudence	67	6.5	10	<1	2	6	10	8	10	6	15	30	12	15	9	**81**
43	Quartzsite Area	98	6.5	3	<1	4	9	10	10	10	2	22.5	30	15	15	3	**85.5**
44	Red Gap Ranch	100	6.5	0	<1	0	10	10	10	10	10	25	30	15	15	15	**100**
45	Red Rocks CAP	99	6.5	0	<1	6	9	10	10	10	0	22.5	30	15	15	0	**82.5**
46	Ryan	100	6.5	5	<1	2	10	10	10	10	6	25	30	15	15	9	**94**
47	Ryland	100	6.5	2	<1	5	10	10	10	10	0	25	30	15	15	0	**85**
48	Saginaw-Valhalla-Snyder Mine Quarry	86	6.5	0	<1	4	8	10	10	10	2	20	30	15	15	9	**83**
49	Saginaw Hill	86	6.5	0	<1	1	8	10	10	10	8	20	30	15	15	12	**92**
50	San Xavier Mine	85	6.5	1	<1	3	8	10	10	10	4	20	30	15	15	6	**86**
51	Silver Creek Landfill	18	6.5	0	<1	4	1	10	10	10	2	2.5	30	15	15	3	**65.5**
52	Silverbell	100	6.5	0	<1	3	10	10	10	10	4	25	30	15	15	4	**91**
53	Snowflake Mine	29	6.5	2	<1	3	2	10	10	10	4	5	30	15	15	6	**71**

Table 4-1
Solar Potential Screening Results

Site		Characteristics Inputs					Criteria Evaluation Values					Weighted Scores per Criteria					Total Score (out of 100)
		Slope (% of site exhibiting <5% slope)	Direct Solar Resource (kWh/m²/day)	Distance to Transmission (Miles)	Distance to Road (Miles)	Sensitive Resources and Land Management (# of sensitive resources)	Slope	Direct Solar Resource	Distance to Transmission	Distance to Road	Sensitive Resources and Land Management	Slope (25%)	Direct Solar Resource (30%)	Distance to Transmission (15%)	Distance to Road (15%)	Sensitive Resources and Land Management (15%)	
54	Snyder Hill Mine	86	6.5	0	<1	2	8	10	10	10	6	20	30	15	15	9	**89**
55	Sonoita Landfill	92	6.5	9	<1	3	9	10	8	10	4	22.5	30	12	15	6	**85.5**
56	St. Mary's	100	6.5	1	<1	3	10	10	10	10	4	25	30	15	15	6	**91**
57	Tombstone Landfill	77	6.5	0	<1	3	7	10	10	10	4	17.5	30	15	15	6	**83.5**
58	Torrez-Brant	100	6.5	3	<1	1	10	10	10	10	8	25	30	15	15	12	**97**
59	Tumamoc	33	6.5	0	<1	3	3	10	10	10	4	7.5	30	15	15	6	**73.5**
60	Twin Peaks-Sandrio CAP	98	6.5	0	<1	3	9	10	10	10	4	22.5	30	15	15	6	**88.5**
61	Valhalla	86	6.5	0	<1	1	8	10	10	10	8	20	30	15	15	12	**92**
62	Vincent Mullins	47	6.5	9	<1	3	4	10	8	10	4	10	30	12	15	6	**73**
63	White Sage Gravel Pits	44	6.5	0	<1	1	4	10	10	10	8	10	30	15	15	12	**82**
64	Wildcat Hill	96	6.5	0	<1	1	9	10	10	10	8	22.5	30	15	15	12	**94.5**

SECTION 5
WIND SITE ASSESSMENT

The following preliminary site assessment evaluates the suitability of utility and community wind power technologies on the 64 nominated sites. Results of the wind assessments are provided in **Section 5.3**, Results.

The general goal of the analysis is to provide a preliminary assessment of the overall potential for developing wind energy on each of the nominated sites. As discussed below, several criteria were developed to support the preliminary assessment. These include slope, wind resource availability, distance to transmission lines, interconnections and roads, and the presence of sensitive resources and/or potentially incompatible land use designations. This analysis provides a first-level screening to identify areas that merit further scrutiny for wind resource development.

Wind power can be well-suited to disturbed or previously disturbed land, due to the widespread availability of the resource and the flexibility in the size and number of turbines that can be installed. Wind turbines can be described by the class of the resource they use to operate. Community wind turbines operate with Class 3 wind, range in size from 50 to 750 kW, and are typically used for non-grid-connected, distributed generation. Utility-scale turbines use Class 4 or higher wind, typically range in size from 750 kW to 2.5 MW, and are used for grid-connected "utility" generation. While small wind turbines theoretically could be grid-connected, and a single large wind turbine could be installed and used for remote power generation, such configurations would not be the least-cost option.

A preliminary site assessment has been carried out by BLM to evaluate the suitability of community and utility wind technologies on the 64 nominated sites. The assessment was based on general topographic and property size suitability, wind potential rating, maximum potential MW output, distribution lines accessible for interconnecting to the grid, distance to different types of load

centers, as well as potential sensitive resources issues. The general goal of the analysis is to provide a preliminary assessment of the overall potential for developing community or utility-scale wind energy stations on each of the 64 nominated sites.

5.1 Community Wind Assessment Methodology

Community wind is intended for small-scale power generation applications and may or may not be interconnected with the power grid. Community wind does not always require a large footprint or power grid or road access. Based on the review of potential assessment criteria, the following site characteristics and methodology were used to assess the suitability of a site for community wind energy development.

5.1.1 Slope

Utilization of current wind energy technology is limited to areas with a slope of 15 percent or less. For this assessment, sites where 100 percent of the land exhibits less than 15 percent slope receive 10 points, 90 to 99 percent receive 9 points, 80 to 89 percent receive 8 points, 70 to 79 percent receive 7 points, 60 to 69 percent receive 6 points, 50 to 59 percent receive 5 points, 40 to 49 percent receive 4 points, 30 to 39 percent receive 3 points, 20 to 29 percent receive 2 points, 10 to 19 percent receive 1 point, and 0-9 percent receive 0 points.

The weight factor of the slope in the overall scale is 25 percent.

5.1.2 Wind Resource Class

Wind resource availability is critical to project viability. Using wind resource class GIS data produced by NREL, sites were assigned a wind potential rating and corresponding score. Areas defined as Class 6, Outstanding (over 600 watts/m^2), received 10 points; areas defined as Class 5, Excellent (500 to 600 watts/m^2), received 8 points; Class 4, Good (400 to 500 watts/m^2) areas received 6 points; and areas assigned Class 3, Fair (300 to 400 watts/m^2), given 4 points. Sites scoring less than Fair were automatically excluded from receiving a wind potential rating. Only three sites have a wind potential rating of Fair and no sites are rated higher than Fair.

The weight factor of wind potential rating in the overall scale is 30 percent.

Community wind site screening may be more acutely impacted by microclimates that may improve or decrease the wind resource.

5.1.3 Distance to Transmission/ Interconnections

The presence of transmission lines/interconnections in close proximity to the site lowers the time and cost necessary for site development. Values were assigned according to the sites' distance from existing transmission lines (ranging between 69-500 kV). Sites less than or equal to 5 miles from transmission lines were assigned 10 points; 8 points for sites 6 to 10 miles; 6 points for sites 11 to

15 miles; 4 points for sites 16 to 20 miles; and 2 points for sites 21 to 25 miles. Sites located more than 25 miles from the nearest 69-500 kV line received 0 points.

The weight factor of distance to transmission line in the overall scale is 10 percent.

The distance to transmission lines is not weighted as heavily as for utility wind because community wind can be utilized for on-site or neighboring site power needs, obviating the need to interconnect with the power grid.

5.1.4 Distance to Load Center

Community wind projects are best-suited for distribution to on-site or nearby load centers because of the scale at which they operate. Values were assigned according to the sites' distance to a potential load center. Sites with onsite or adjacent load centers were assigned 10 points; 8 points for sites 1 to 2 miles; 6 points for sites 3 to 4 miles; 4 points for sites 5 to 6 miles; and 2 points for sites 7 to 8 miles. Sites located more than 8 miles from a potential load center received 0 points.

Distances were estimated using satellite imagery and the weight factor of distance to load center in the overall scale is 10 percent.

5.1.5 Sensitive Resources and Land Management

The presence of sensitive resources or incompatible land management designations can increase time and cost necessary to develop a site or prohibit development altogether. The nominated sites were screened for 12 criteria: AZGFD Species and Habitat Conservation Guide Conservation Potential, AZGFD big game habitat, AZGFD wildlife corridors, special status species habitat (including threatened and endangered species habitat), desert tortoise habitat, mapped wetlands, 100-year floodplains, sensitive soils, mining claims, access, adjacent land uses, and ROWs. In addition, sites located on BLM-administered land were screened for VRM Class I, II, and III classification; SRMA designation; and ROW exclusion or avoidance designations. Developers will need to consult with the relevant agencies to determine the effect a criterion will have on their project; thus, the presence of one or more criterion is simply an indicator that additional consultation will likely be required.

Because smaller sites are used for community wind, the developer may have fewer mitigation options when sensitive resources are present. As such, this criterion is weighted more heavily than for utility wind.

Sites with 0 criteria received 10 points, sites with 1 criterion received 8 points, sites with 2 criteria received 6 points, sites with 3 criteria received 4 points, sites with 4 criteria received 2 points, and sites with 5 or more criteria received 0 points.

The weight factor of sensitive resources in the overall scale is 25 percent.

5.2 UTILITY WIND ASSESSMENT METHODOLOGY

Utility wind is intended for larger-scale, grid-connected power generation applications and, thus, should have a footprint of at least 50 acres and be within 25 miles to transmission and graded roads. This section discusses site characteristics used to assess the suitability of a site for utility wind energy technology development.

5.2.1 Area

Sites with less than 50 acres of developable land are considered infeasible for utility wind development and receive 0 points. Sites with more than 50 acres of developable land receive a full 10 points. The weight factor of the area in the overall scale is 10 percent.

5.2.2 Slope

Utilization of current wind energy technology is limited to areas with a slope of 15 percent or less. For this assessment, sites where 100 percent of the land exhibits less than 15 percent slope receive 10 points, 90 to 99 percent receive 9 points, 80 to 89 percent receive 8 points, 70 to 79 percent receive 7 points, 60 to 69 percent receive 6 points, 50 to 59 percent receive 5 points, 40 to 49 percent receive 4 points, 30 to 39 percent receive 3 points, 20 to 29 percent receive 2 points, 10 to 19 percent receive 1 point, and 0 to 9 percent receive 0 points.

The weight factor of the slope in the overall scale is 20 percent.

5.2.3 Wind Resource Class

Wind resource availability is critical to project viability. Using wind resource class GIS data produced by NREL, sites were assigned a wind potential rating and corresponding score. Areas defined as Class 6, Outstanding (over 600 watts/m^2), were assigned 10 points; areas defined as Class 5, Excellent (500 to 600 watts/m^2), were assigned 8 points; Class 4, Good (400 to 500 watts/m^2) areas were assigned 6 points; and areas assigned Class 3, Fair (300 to 400 watts/m^2), were assigned 4 points. Sites scoring less than Fair were automatically excluded from receiving a wind potential rating. The weight factor of wind potential rating in the overall scale is 25 percent.

5.2.4 Distance to Transmission/ Interconnections

The presence of transmission lines/interconnections in close proximity to the site lowers the time and cost necessary for site development. Values were assigned according to the sites' distance from existing transmission lines (ranging between 69-500 kV). Sites less than or equal to 5 miles from transmission lines were assigned 10 points; 8 points for sites 6-10 miles; 6 points for sites 11-15 miles; 4 points for sites 16-20 miles; and 2 points for sites 21-25 miles. Sites located more than 25 miles from the nearest 69-500 kV line received 0 points.

The weight factor of distance to transmission line in the overall scale is 15 percent.

5.2.5 Distance to Roads

The presence of graded roads in close proximity to the site lowers the time and cost necessary for site development. Values were assigned according to the sites distance from graded roads. Sites less than or equal to 5 miles from graded roads were assigned 10 points; 8 points for sites 6 to 10 miles; 6 points for sites 11 to 15 miles; 4 points for sites 16 to 20 miles; and 2 points for sites 21 to 25 miles. Sites located more than 25 miles from the nearest graded road received 0 points.

The weight factor of distance to graded roads in the overall scale is 15 percent.

5.2.6 Sensitive Resources and Land Management

The presence of sensitive resources or incompatible land management designations can increase time and cost necessary to develop a site or prohibit development altogether. The nominated sites were screened for 12 criteria: AZGFD Species and Habitat Conservation Guide Conservation Potential, AZGFD big game habitat, AZGFD wildlife corridors, special status species habitat (including threatened and endangered species habitat), desert tortoise habitat, mapped wetlands, 100-year floodplains, sensitive soils, mining claims, access, adjacent land uses, and ROWs. In addition, sites located on BLM-administered land were screened for VRM Class I, II, and III; SRMA designations; and ROW exclusion or avoidance designations. Developers will need to consult with the relevant agencies to determine the effect a criterion will have on their project; thus, the presence of one or more criterion is simply an indicator that additional consultation will likely be required.

Sites with 0 criteria received 10 points, sites with 1 criterion received 8 points, sites with 2 criteria received 6 points, sites with 3 criteria received 4 points, sites with 4 criteria received 2 points, and sites with 5 or more criteria received 0 points.

The weight factor of sensitive resources in the overall scale is 15 percent.

5.3 Results

Only three of the nominated sites have any wind resource potential: Brady Wash Pipeline (6-acre portion), Red Gap Ranch (1,700-acre portion), and Silver Creek Landfill (11-acre portion) are all rated “Fair.” The small number of suitable acres at Brady Wash Pipeline and Silver Creek Landfill likely eliminate them from consideration for utility wind. Under the scoring system for community wind, those sites receive 39.5 and 37.5 points, respectively. Red Gap Ranch receives 60 points for community wind and 76 points for utility wind. No other nominated sites are considered ideal for wind energy development because they lack an adequate wind resource class.

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SECTION 6
REFERENCES AND DATA SETS FOR GIS SCREENING

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SECTION 7
NOMINATED SITE PROFILES

7.1 INTRODUCTION

Based on an extensive public outreach process, the BLM and public identified 64 previously disturbed sites on federal, (including BLM-administered), state, municipal, and private lands (refer to **Figure 1-1**, RDEP Nominated Sites and **Table 1-1**, RDEP Nominated Site Summaries) that may potentially be suitable for renewable energy development. Site types include gravel pits, mine sites, landfills, isolated parcels that have been disturbed, marginal or impaired agricultural lands, abandoned unauthorized airstrips, and CAP ROW. These 64 sites are not an exhaustive list, as there may be other disturbed lands in the state; however, they serve as a reasonable sample to understand the potential issues associated with reuse for renewable power on disturbed lands.

Detailed *Nominated Site Profiles* for each site are provided in this section and include the following information:

- Location facts, including site size, location, previous land use, adjacent land use(s), and surface and mineral ownership;
- Site characteristics, including solar and wind potential rating, estimated solar and wind generation capacity, developable acres, distance to graded roads, distance to transmission interconnections, and groundwater;
- Select environmental factors, including those for wildlife, vegetation, sensitive or listed species, wetlands, hydrology, special designations, land use, etc.;
- Site opportunities and constraints;
- Suggested remediation and restoration requirements; and
- Summary describing the overall potential of the site for renewable energy development.

These profiles are intended to provide a preliminary indication of whether or not a particular site is suitable for solar or wind energy development. Although these sites have been identified as previously disturbed sites, the overall context of the site's location is considered in determining the site's characteristics, and opportunities and constraints. For example, a site profile may list critical habitat as an environmental factor; indicating that, although the site is disturbed, it may contain critical habitat on portions of the sites. Environmental factors and site constraints do not necessarily indicate that a site is unsuitable for development but that a developer should be aware of these factors as they plan for a project.

The information contained within each site profile has been created to give an overview of each site and is not a guarantee of a site's suitability for energy development. Developers should consult with appropriate government agencies and undertake further research before making a final determination on a site's suitability for their project(s).

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #1

Solar Score: 88.5

Community Wind Score

Utility Wind Score

Estimated Maximum Potential Capacity[1]

Solar: 24 MW **Wind: None**

Name:
19th Avenue Landfill

Facts:

Acres: 191

County: Maricopa

Previous Land Use: Landfill

Adjacent Land Use: Industrial, undeveloped

Surface Ownership: Private

Mineral Ownership: Private

Legal Description: T.1N, R.3E, sec. 19, Lots 1-3, E2NW, NESW

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Active Management Area
* Special Status Species habitat
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	191
Slope <5%	188 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	1 mile
115kV	3 miles
230kV	1 miles
500kV	2 miles
Active Management Area	Yes

Selected Environmental Factors

- In an urban area
- Special status species
- Adjacent to Salt River channel
- AZGFD Conservation Potential area

Disclaimer: Nominated Sites Summary Sheets are intended to provide a preliminary indication of whether or not a particular site is suitable for solar or wind energy development. The information contained within this site summary has been created to give an overview of each site and is not a guarantee of a site's suitability for energy development. Developers should consult with appropriate government agencies and undertake further research before making a final determination on a site's suitability for their project(s).

SITE #1

Remediation/Restoration Requirements

The 19th Avenue Landfill was on the National Priorities List until 2006 when it was deleted. The EPA and the State of Arizona (through ADEQ) determined at that time that all appropriate response actions under CERCLA had been completed. Operation and maintenance and five year reviews continue at the Site. This deletion does not preclude future actions under Superfund. While nearby underground storage tanks and leaking underground storage tanks are present, none are expected to contribute to contamination at or near the surface of the project site since the surface is a soil cap above surface grade underlain by a thick layer of solid waste. Likewise, none of the other area Superfund sites are expected to contribute contamination to the Site.

On-going remediation requirements may limit the type and location of solar and wind energy facilities. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 24 MW solar energy facility would fit on the 188 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

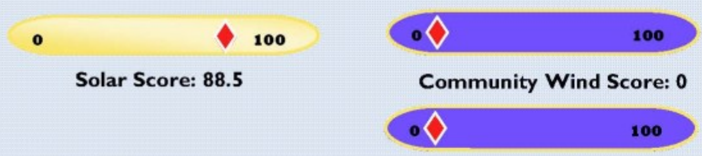
The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on a landfill. For example, gas collection systems may require setbacks and other siting considerations. Technical feasibility of solar and wind developments on landfills depends on compatibility of the solar or wind systems with the existing landfill components.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #2



Solar Score: 88.5

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 104 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Desert Tortoise habitat
* Arizona Game and Fish Department Conservation Potential
* Managed as VRM Class III
* AZGFD Species and Habitat Conservation Guide Conservation Potential

Name:
Belmont Mountain CAP

Facts:

Acres: 841

County: Maricopa

Previous Land Use: Bureau of Reclamation ROW

Adjacent Land Use: Undeveloped

Surface Ownership: Bureau of Reclamation

Mineral Ownership: Federal

Legal Description: T.3N., R.7W., sec. 23, 24, 26, 27 (partial sections), T.3N., R.6W sec 15,16,17,18,19,20,21 (partial sections).

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		841
Slope <5%		830 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	7 miles
	115kV	32 miles
	230kV	5 miles
	500kV	6 miles
Active Management Area		Yes

Selected Environmental Factors

- Managed as VRM Class III
- Desert tortoise habitat
- Arizona Game and Fish Department Conservation Potential
- AZGFD Conservation Potential area

Disclaimer: Nominated Sites Summary Sheets are intended to provide a preliminary indication of whether or not a particular site is suitable for solar or wind energy development. The information contained within this site summary has been created to give an overview of each site and is not a guarantee of a site's suitability for energy development. Developers should consult with appropriate government agencies and undertake further research before making a final determination on a site's suitability for their project(s).

SITE #2

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 104 MW solar energy facility would fit on the 830 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV and CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

This site is located within desert tortoise habitat and developers should consult with the BLM and the USFWS regarding potential mitigation and compliance measures.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

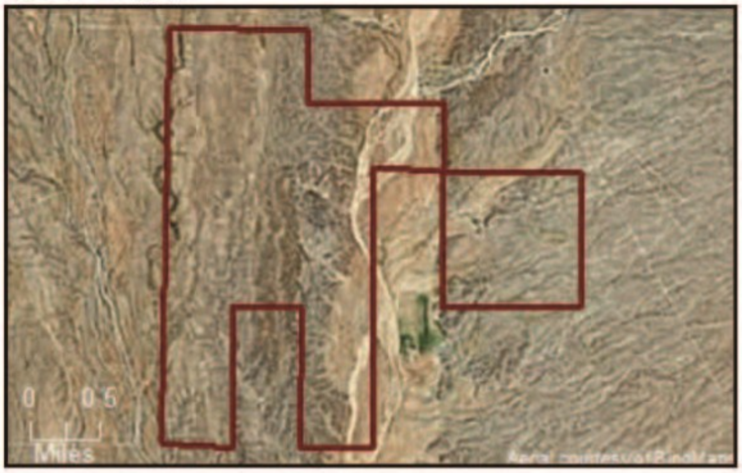
The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

These lands were originally surveyed under the NEPA process before construction of the Central Arizona Project (CAP). This includes areas identified by Reclamation as wildlife habitat areas ("green-up" areas) to be managed as mitigation for impacts from the CAP construction. Use of such areas would require consideration of mitigation for losses of wildlife habitat.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #3



Name:
Belmont Proposed Disposal

Facts:

Acres: 3,174

County: Maricopa

Previous Land Use: Undeveloped

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.3N., R.5W., sec. 22, All; sec. 23, S2; sec. 25, all; sec. 26, W2; sec. 77 all; sec. 34, W2; sec. 35, W2.

0 100
Solar Score: 82.5

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 397 MW **Wind: None**

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	3,174
Slope <5%	3,037 acres
Distance to Graded Road	1-2 miles
Distance to Transmission Interconnection:	
69kV	13 miles
115kV	23 miles
230kV	0 miles
500kV	2 miles
Active Management Area	Yes

Selected Environmental Factors

- River or wash runs through site area
- 360 acres of site identified as FEMA 100-year floodplain
- Site is close to a load center
- Site is identified for disposal by BLM

Site Opportunities

- Majority of site has slope of <5%
- Site is close to transmission lines and roads
- Site is close to a load center

Site Constraints

- Active Management Area
- 360 acres of site identified as FEMA 100-year floodplain
- River or wash runs through site area
- Access may be hampered by surrounding private lands

Disclaimer: Nominated Sites Summary Sheets are intended to provide a preliminary indication of whether or not a particular site is suitable for solar or wind energy development. The information contained within this site summary has been created to give an overview of each site and is not a guarantee of a site's suitability for energy development. Developers should consult with appropriate government agencies and undertake further research before making a final determination on a site's suitability for their project(s).

SITE #3

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 397 MW solar energy facility would fit on the 3,174 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

A portion of this site lies within a 100-year floodplain and is likely unsuitable for development.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #4

0 ◆ 100

Solar Score: 91

Site is less than 100 acres and may not be suitable for CSP technology.

0 ◆ 100

Community Wind Score: 0

0 ◆ 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 3.1 MW **Wind: None**

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Desert tortoise habitat
* AZGFD Species and Habitat Conservation Guide Conservation Potential

Name:
Black Canyon City Landfill

Facts:

Acres: 25

County: Yavapai

Previous Land Use: Landfill

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: n/a

Legal Description: T.8N., R.2E., sec. 1

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		25
Slope <5%		25 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	10 miles
	115kV	36 miles
	230kV	2 miles
	500kV	0 miles
Active Management Area		No

Selected Environmental Factors

- AZGFD Conservation Potential area
- Desert tortoise Habitat

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SITE #4

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 3.1 MW solar energy facility would fit on the 25 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site is located within desert tortoise habitat and developers should consult with the land management agency, if applicable, and the USFWS regarding potential mitigation and compliance measures.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on a landfill. For example, gas collection systems may require setbacks and other siting considerations. Technical feasibility of solar and wind developments on landfills depends on compatibility of the solar or wind systems with the existing landfill components.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #5

Solar Score: 76.5

Community Wind Score:

Utility Wind Score:

Estimated Maximum Potential Capacity[1]

Solar: 26 MW **Wind: None**

Name:
Black Rock Gypsum Mine

Facts:

Acres: 679

County: La Paz

Previous Land Use: Mine

Adjacent Land Use: BLM-owned; wilderness and state lands

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.41N., R.12W.; T.41N., R.13W.

Site Opportunities

* Site is close to transmission lines and roads

Site Constraints

* Only 31 percent of site has slope of <5%
* Special Recreation Management Area
* Special Status Species Habitat

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		679
Slope <5%		210 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	98 miles
	115kV	164 miles
	230kV	110 miles
	500kV	0.1 miles
Active Management Area		No

Selected Environmental Factors

- Mountainous area with significant washes
- Special Status Species habitat
- Special Recreation Management Area

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SITE #5

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary
A 26 MW solar energy facility would fit on the 210 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site is located within a Special Recreation Management Area, which may place limitations on development. Developers should consult with the BLM to determine allowable uses in this area.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #6

Name:
Bouse Hills CAP

Facts:

Acres: 120

County: La Paz

Previous Land Use: CAP right-of-way

Adjacent Land Use: CAP sites and undeveloped land

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.7N., R.16W., sec. 9, E2; sec. 10, W2.

Nominated By: CAP

0 100

Solar Score: 86.5

0 100

Community Wind Score:

0 100

Utility Wind Score:

Estimated Maximum Potential Capacity[1]

Solar: 11.8 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Desert tortoise habitat

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	120
Slope <5%	94
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	22 miles
115kV	17 miles
230kV	8 miles
500kV	30 miles
Active Management Area	No

Selected Environmental Factors

- Canal on site
- Desert tortoise habitat
- Site is close to a load center

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SITE #6

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

An 11.8 MW solar energy facility would fit on the 94 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV technology. CSP development may become feasible as technology improves.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

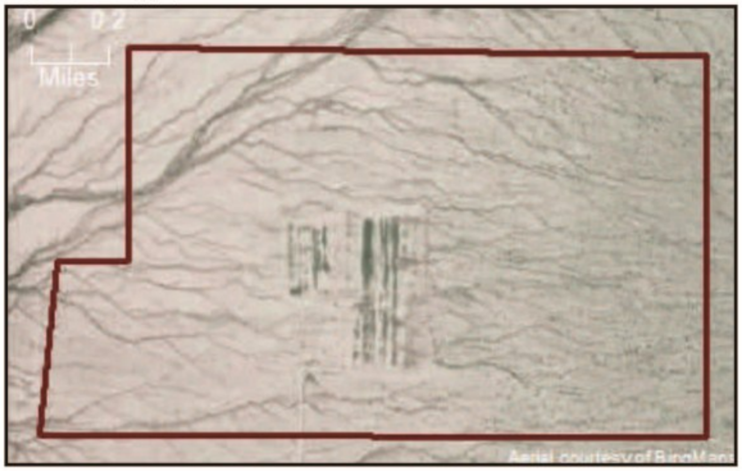
There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

This site is located within desert tortoise habitat and developers should consult with the land management agency, if applicable, and the USFWS regarding potential mitigation and compliance measures.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #7



Name:
Brady CAP Site

Facts:

Acres: 1,023

County: Pinal

Previous Land Use: CAP; reconveyed lands

Adjacent Land Use: CAP site;, undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.7S., R.9E., sec. 3, lots 1-4, S2N2, S2; sec. 4, lots 1-2, S2NE, S2.

Solar Score: 85

Community Wind Score:

Utility Wind Score:

Estimated Maximum Potential Capacity[1]

Solar: 128 MW **Wind: None**

Site Opportunities

* Entire site has slope of <5%
* Site is close to roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* AZGFD big game habitat
* Topography related to borrow pit activities

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	1,023
Slope <5%	1,023 acres
Distance to Graded Road	1-2 miles
Distance to Transmission Interconnection:	
69kV	35 miles
115kV	7 miles
230kV	11 miles
500kV	19 miles
Active Management Area	Yes

Selected Environmental Factors

- Multiple streams and/or washes present
- AZGFD big game habitat
- Active Management Area
- Site is close to a load center

SITE #7

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

The Brady Pumping Plant is a hazardous waste generator. No spills have been reported.

Site Summary

A 128 MW solar energy facility would fit on the 1,023 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for CSP or PV technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

This site contains AZGFD big game habitat and may be subject to mitigation requirements to protect species viability.

Portions of this site were previously used as a borrow pit during construction of the CAP canal. These areas may require restoration prior to construction of solar energy projects.

SITE #8

Name:
Brady Wash Pipeline

Facts:

Acres: 3,240

County: Pinal

Previous Land Use: Utility Corridor

Adjacent Land Use: BLM

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.7S., R.13E., sec. 3, S2; sec. 4, Lots 1-4, S2N2, S2; sec. 5, Lots 1-4, S2N2, S2; sec. 8, W2; sec. 17, all; sec. 22, All.

0 100
Solar Score: 74.5

0 100
Community Wind Score: 39.5

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 289 MW **Wind: 0.2 MW**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads

Site Constraints

* Active Management Area
* Special Status Species habitat (2,700 acres)
* Managed as VRM Class III
* Desert tortoise habitat
* AZGFD big game habitat
* Grazing leases

About This Site

Characteristic	**Description**
Solar Potential	Good
Wind Potential	Fair (6 acres)
Acres	3,240
Slope <5%	2,310 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	54 miles
115kV	7 miles
230kV	25 miles
500kV	5 miles
Active Management Area	Yes

Selected Environmental Factors

- Managed as VRM Class III
- AZGFD big game habitat
- Special Status Species habitat (2,700 acres)
- Desert tortoise habitat
- Site is identified for disposal by BLM

SITE #8

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 289 MW solar energy facility would fit on the 2,310 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology. With six acres rated as "fair" for wind potential, this site could be a candidate for community wind generation.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

This site is located within desert tortoise habitat and developers should consult with the land management agency, if applicable, and the USFWS regarding potential mitigation and compliance measures.

This site contains AZGFD big game habitat and may be subject to mitigation requirements to protect species viability.

Grazing occurs on this site, and would require termination of the lease or mitigation to minimize impacts to grazing operations.

Restoration Design Energy Project
Environmental Impact Statement—Nominated Sites Summary

SITE #9

Name:
Butler Valley

Facts:

Acres: 83,013

County: La Paz

Previous Land Use: Agricultural

Adjacent Land Use: Undeveloped

Surface Ownership: State

Mineral Ownership: State

Legal Description: T.7N., R13W; T.7N., R14W; T.7N., R15W; T.8N, R13W; T.8N, R14W

0 100
Solar Score: 88.5

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 10,214 MW **Wind: None**

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	83,013
Slope <5%	81,710 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	22 miles
115kV	21 miles
230kV	0 miles
500kV	25 miles
Active Management Area	No

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Special Status Species habitat (7,440 acres)
* Desert tortoise habitat (13,100 acres)

Selected Environmental Factors

- Potential mining claims
- Desert tortoise habitat (13,100 acres)
- Special Status Species habitat (7,440 acres)

SITE #9

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 10,214 MW solar energy facility would fit on the 81,710 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site is located within desert tortoise habitat and developers should consult with the land management agency, if applicable, and the USFWS regarding potential mitigation and compliance measures.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #10

0 100

Solar Score: 91

Site is less than 100 acres and may not be suitable for CSP technology.

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 8.5 MW **Wind: None**

Name:
Cave Creek 2

Facts:

Acres: 68

County: Maricopa

Previous Land Use: Landfill

Adjacent Land Use: Recreational, residential, undeveloped

Surface Ownership: State

Mineral Ownership: State

Legal Description: T.5N., R.3E., sec. 12, E2SE, SENE.

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Potentially incompatible adjacent land uses

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		68
Slope <5%		68 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	2 miles
	115kV	20 miles
	230kV	0.4 miles
	500kV	13 miles
Active Management Area		Yes

Selected Environmental Factors

- Near load center
- Active Management Area
- Near transmission lines and roads

SITE #10

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

An 8.5 MW solar energy facility would fit on the 68 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

This location is known to be near sensitive cultural resources. Documentation of the cultural resources would be required and avoidance of impacts to these areas would be considered in reviewing any applications for development.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #11

0 100
Solar Score: 88

Site is less than 100 acres and may not be suitable for CSP technology.

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 5.3 MW **Wind: None**

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Potentially incompatible adjacent land uses
* AZGFD Species and Habitat Conservation Guide Conservation Potential

Name:
Cave Creek Landfill

Facts:

Acres: 42

County: Maricopa

Previous Land Use: Landfill

Adjacent Land Use: Recreational, residential, undeveloped

Surface Ownership: n/a

Mineral Ownership: n/a

Legal Description: T.5N., R.4E., sec. 7, Lots 5-12

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		42
Slope <5%		42 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	2 mile
	115kV	21 miles
	230kV	1 mile
	500kV	13 miles
Active Management Area		Yes

Selected Environmental Factors

- Near load center
- Active Management Area
- Near transmission lines and roads
- AZGFD Conservation Potential area

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SITE #11

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 5.3 MW solar energy facility would fit on the 42 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on a landfill. For example, gas collection systems may require setbacks and other siting considerations. Technical feasibility of solar and wind developments on landfills depends on compatibility of the solar or wind systems with the existing landfill components.

This location is known to be near sensitive cultural resources. Documentation of the cultural resources would be required and avoidance of impacts to these areas would be considered in reviewing any applications for development.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #12

Name:
Chevron Vacant Land

Facts:

Acres: 7,812

County: Pinal

Previous Land Use: Undeveloped

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: n/a

Legal Description: Township 07 South, Range 12 East, Sec. 21-23, 25-29, 31, and 33 – 35.

0 100

Solar Score: 79.5

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 948 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads

Site Constraints

* Active Management Area
* AZGFD big game habitat
* Desert tortoise habitat (6,780 acres)
* Mining claims and road and pipeline ROWs present
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		7812
Slope <5%		7586 acres
Distance to Graded Road		3-4 miles
Distance to Transmission Interconnection:		
	69kV	46 miles
	115kV	0 miles
	230kV	17 miles
	500kV	10 miles
Active Management Area		Yes

Selected Environmental Factors

- AZGFD big game habitat
- Desert tortoise habitat (6,780 acres)
- Mining claims and road and pipeline ROWs present
- Site is identified for disposal by BLM
- AZGFD Conservation Potential area

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SITE #12

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 948 MW solar energy facility would fit on the 7,586 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for CSP or PV technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

This site contains AZGFD big game habitat and may be subject to mitigation requirements to protect species viability.

This site is located within desert tortoise habitat and developers should consult with the land management agency, if applicable, and the USFWS regarding potential mitigation and compliance measures.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #13

Name:
Christmas Mine

Facts:

Acres: 496

County: Gila

Previous Land Use: Mine

Adjacent Land Use: Undeveloped

Surface Ownership: Private

Mineral Ownership: n/a

Legal Description: n/a

Solar Score: 0*

Community Wind Score: 0

Utility Wind Score: 0

* Because this site has 0 acres with < 5% slope, it is considered undevelopable with current technology.

Estimated Maximum Potential Capacity[1]

Solar: None **Wind: None**

Site Opportunities

* Solar potential rating of Good on entire site
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Little or no flat terrain
* Desert tortoise habitat
* Special Status Species habitat
* AZGFD big game habitat
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic		Description
Solar Potential		None
Wind Potential		None
Acres		496
Slope <5%		0 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	77 miles
	115kV	5 miles
	230kV	22 miles
	500kV	16 miles
Active Management Area		No

Selected Environmental Factors

- Mining claims present
- Mountainous area
- Desert tortoise Habitat
- Special Status Species habitat
- AZGFD big game habitat
- AZGFD Conservation Potential area

SITE #13

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

A leaking underground storage tank (LUST) exists approximately 0.8 mile to the southeast of the site boundary. Due to the distance from the site and the rugged topography between the LUST and the site, no contamination at the site from the LUST is expected.

On-going remediation requirements may limit the type and location of solar and wind energy facilities. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

Because this site does not exhibit land with a slope of <5 percent, solar energy generation would be difficult.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

Developers should consult with mineral estate owner/administrator regarding the potential for existing mining claims that could limit renewable energy development.

This site is located within desert tortoise habitat and developers should consult with the land management agency, if applicable, and the USFWS regarding potential mitigation and compliance measures.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site contains AZGFD big game habitat and may be subject to mitigation requirements to protect species viability.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #14

0 100
Solar Score: 83

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 94 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to roads
* Site is close to a load center

Site Constraints

* Special Status Species habitat
* Mining claims and ROWs present
* Managed as VRM Class III
* Sensitive soils

Name:
Copperstone Mine

Facts:

Acres: 929

County: La Paz

Previous Land Use: Gold mine

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.6N., R.20W., sec. 12, S2; sec. 13, NE.

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		929
Slope <5%		750 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	30 miles
	115kV	9 miles
	230kV	24 miles
	500kV	18 miles
Active Management Area		No

Selected Environmental Factors

- Mining claims and ROWs present
- Managed as VRM Class III
- Special Status Species habitat (240 acres)
- Sensitive soils

SITE #14

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 94 MW solar energy facility would fit on the 750 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Developers should consult with mineral estate owner/administrator regarding the potential for existing mining claims that could limit renewable energy development. In addition, there may be ROWs on-site. Developers should contact land managers and ROW-holders to determine the nature of on-site ROWs and what, if any, restrictions they may pose.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

Soil properties on this site may restrict renewable energy development. Some soil types require additional engineering requirements to support solar or wind energy infrastructure foundations. Further research through the property owner/administrator and USDA NRCS is recommended.

SITE #15

0 100
Solar Score: 62.5

Site is less than 100 acres and may not be suitable for CSP technology.

0 100
Community Wind Score:

0 100
Utility Wind Score:

Estimated Maximum Potential Capacity[1]

Solar: 0.3 MW **Wind: None**

Site Opportunities

* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* ROW present
* Special Status Species habitat
* AZGFD big game habitat
* Managed as VRM Class III
* Potentially incompatible adjacent land uses
* AZGFD Species and Habitat Conservation Guide Conservation Potential

Name:
Cordes Lakes Hazmat Site

Facts:

Acres: 14

County: Yavapai

Previous Land Use: Hazmat site

Adjacent Land Use: Residential, undeveloped, transportation

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.11N., R.2E., sec. 23, Lots 25, 28.

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		14
Slope <5%		2 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	27 miles
	115kV	27 miles
	230kV	1 mile
	500kV	2 miles
Active Management Area		No

Selected Environmental Factors

- ROW present
- Managed as VRM Class III
- AZGFD big game habitat
- Special Status Species habitat
- AZGFD Conservation Potential area

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SITE #15

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 0.3 MW solar energy facility would fit on the 2 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be ROWs on-site. Developers should contact land managers and ROW-holders to determine the nature of on-site ROWs and what, if any, restrictions they may pose.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site contains AZGFD big game habitat and may be subject to mitigation requirements to protect species viability.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #16

0 100

Solar Score: 82

Site is less than 100 acres and may not be suitable for CSP technology.

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 3.3 MW **Wind: None**

Site Opportunities

* Site is close to transmission lines and roads

Site Constraints

* Only 41% of site exhibits slopes < 5 percent
* Active Management Area
* Special Status Species Habitat

Name:
Dateland Gravel Pit

Facts:

Acres: 64

County: Yuma

Previous Land Use: Mineral materials site

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.7S., R.12W, sec. 21, SW1/4; sec. 28, NW1/4.

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	64
Slope <5%	26 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	19 miles
115kV	56 miles
230kV	1 mile
500kV	9 miles
Active Management Area	No

Selected Environmental Factors

- Mining claim present
- Special Status Species habitat
- Near transmission lines and roads

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SITE #16

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 3.3 MW solar energy facility would fit on the 26 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #17

Name:
Detrital Wash

Facts:

Acres: 17,695

County: Mohave

Previous Land Use: Detrital wash

Adjacent Land Use: NPS, BLM, BOR lands; near reservation; adjacent to Mohave Wind Project

Surface Ownership: State

Mineral Ownership: State

Legal Description: T.28N., R.21W.; T.29N., R.21W.; T.29N., R.20W.

Solar Score: 91.5

Community Wind Score:

Utility Wind Score:

Estimated Maximum Potential Capacity[1]

Solar: 2,104 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Minimal environmental constraints

Site Constraints

* Special Status Species habitat (6,270 acres)
* Washes on site

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		17,695
Slope <5%		16,828 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	42 miles
	115kV	109 miles
	230kV	37 miles
	500kV	0 miles
Active Management Area		No

Selected Environmental Factors

- Washes on site
- Special Status Species habitat (6,270 acres)

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SITE #17

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 2,104 MW solar energy facility would fit on the 16,828 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

The site contains 6,270 acres of habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #18

0 100

Solar Score: 85.5

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 237 MW **Wind: None**

Name:
DogTown Mine

Facts:

Acres: 2,080

County: Pima

Previous Land Use: Mine

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: State

Legal Description: T.17S., R.12E., sec. 10

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Active Management Area
* Special Status Species Habitat
* Mining claims present
* Managed as VRM Class III
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		2,080
Slope <5%		1,892 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	30 miles
	115kV	0.2 miles
	230kV	2 miles
	500kV	43 miles
Active Management Area		Yes

Selected Environmental Factors

- Mining claims present
- Managed as VRM Class III
- Special Status Species habitat
- Site is close to transmission lines and roads
- Part of site identified for disposal by BLM
- AZGFD Conservation Potential area

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SITE #18

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 237 MW solar energy facility would fit on the 1,892 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for CSP or PV technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Developers should consult with mineral estate owner/administrator regarding the potential for existing mining claims that could limit renewable energy development.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

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SITE #19

Solar Score: 94

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 85 MW **Wind: None**

Name:
Empire Farms

Facts:

Acres: 682

County: Pinal

Previous Land Use: Agricultural

Adjacent Land Use: Residential, undeveloped

Surface Ownership: State

Mineral Ownership: State

Legal Description: T.3S., R.8E., sec. 7, E2; sec. 8, SW, W2NW; sec. 18, lot 1.

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Special Status Species habitat (570 acres)
* Potentially incompatible adjacent land uses

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	682
Slope <5%	682 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	33 miles
115kV	10 miles
230kV	0 miles
500kV	10 miles
Active Management Area	Yes

Selected Environmental Factors

- Special Status Species habitat (570 acres)

SITE #19

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks (USTs) at the site or within a quarter mile of its boundaries. The nearest UST is at approximately 0.3 mile to the northwest along West Hunt Highway. No leaks are reported. The nearest portion of the farm is at the same elevation (i.e. neither upgradient nor downgradient) as the UST. The central portion of the farm is slightly downgradient from the UST, but given the gentle slope and the distance to that part of the farm is 0.7 mile, as well as no reports of leakage, it is considered unlikely that there would be any groundwater contamination from this UST.

Soils in agricultural lands may contain harmful pesticides, necessitating the need for soil testing and potential remediation. Pesticides and other contaminants can be released during construction and other ground-disturbing activities.

Site Summary

An 85 MW solar energy facility would fit on the 682 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #20

Name:
Florence-Price Dump

Facts:

Acres: 85

County: Pinal

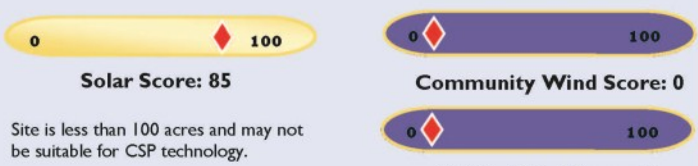
Previous Land Use: Landfill

Adjacent Land Use: Neighboring National Guard use in sec. 17

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.4S., R.10E., sec. 19, lots 2-3, N2NE, E2NW, NESW.



Solar Score: 85

Site is less than 100 acres and may not be suitable for CSP technology.

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 10.6 MW **Wind: None**

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	85
Slope <5%	85 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	47 miles
115kV	0.3 miles
230kV	9 miles
500kV	14 miles
Active Management Area	Yes

Selected Environmental Factors

- Managed as VRM Class III
- Special Status Species habitat
- Site is identified for disposal by BLM
- AZGFD Conservation Potential area

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Special Status Species habitat
* Managed as VRM Class III
* AZGFD Species and Habitat Conservation Guide Conservation Potential

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SITE #20

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 10.6 MW solar energy facility would fit on the 85 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #21

0 100
Solar Score: 78.5

0 100
Community Wind Score:

0 100
Utility Wind Score:

Estimated Maximum Potential Capacity[1]

Solar: 94 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Special Status Species Habitat

Name:
Foothills Proposed Disposal

Facts:

Acres: 1,355

County: Maricopa

Previous Land Use: Undeveloped

Adjacent Land Use: Undeveloped, rural residential, transportation

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.1N., R.4W.

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	1,355
Slope <5%	749 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	4 miles
115kV	19 miles
230kV	0 miles
500kV	0 miles
Active Management Area	Yes

Selected Environmental Factors

- Mining claims present
- Special Status Species habitat (870 acres)
- Near transmission lines and roads
- Site is identified for disposal by BLM

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SITE #21

Remediation/Restoration Requirements

A search of federal and state records indicates one underground storage tank (UST) at the southeast corner of the site. Since no leaks have been reported and the UST is downgradient from the adjacent portions of the site, no contamination at the site from this UST is expected. There are no other indications of present or past contamination or presence of USTs within a quarter mile of its boundaries.

Site Summary

A 94 MW solar energy facility would fit on the 749 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

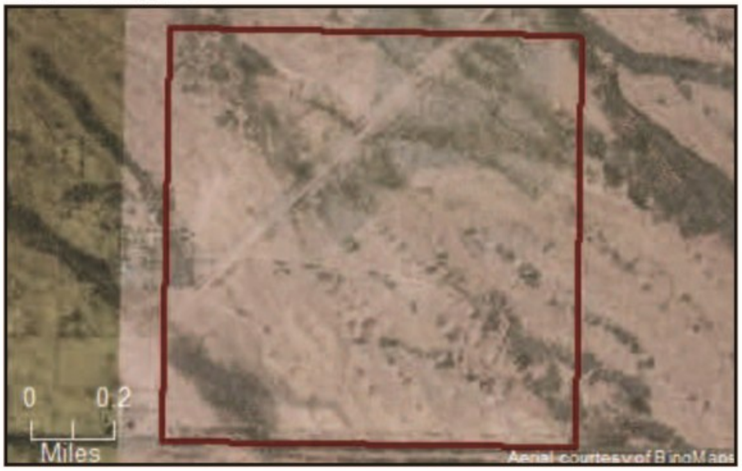
As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #22



Name:
Forepaugh Airport

Facts:

Acres: 635

County: Maricopa

Previous Land Use: Airport

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: n/a

Legal Description: T.7N., R.7W., sec. 16, all.

0 100
Solar Score: 94

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 79 MW **Wind: None**

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	635
Slope <5%	635 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	0 miles
115kV	42 miles
230kV	10 miles
500kV	1 mile
Active Management Area	No

Selected Environmental Factors

- AZGFD wildlife corridor
- Site is near transmission lines and roads
- Site is identified for disposal by BLM

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* AZGFD wildlife corridor

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SITE #22

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 79 MW solar energy facility would fit on the 635 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

The site is part of a wildlife corridor identified by the AZGFD and provides important habitat connectivity for certain species. Consultation with AZGFD will help determine the affected species and any necessary mitigation measures.

This location is known to be near sensitive cultural resources. Documentation of the cultural resources would be required and avoidance of impacts to these areas would be considered in reviewing any applications for development.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #23

Name:
Fredonia Landfill

Facts:

Acres: 21

County: Coconino

Previous Land Use: Landfill

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.41N., R.2W., sec. 22, N2NWNE, N2NENW.

0 100

Solar Score: 86

Site is less than 100 acres and may not be suitable for CSP technology.

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 2.3 MW **Wind: None**

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	21
Slope <5%	18 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	45 miles
115kV	160 miles
230kV	48 miles
500kV	4 miles
Active Management Area	No

Selected Environmental Factors

- ROW present
- Managed as VRM Class III
- Special Recreation Management Area
- Special Status Species habitat
- Sensitive soils
- Site is identified for disposal by BLM

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* ROW Present
* Special Status Species Habitat
* Special Recreation Management Area
* Managed as VRM Class III

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SITE #23

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks (USTs) at the site or within a quarter mile of its boundaries. There is one UST and one leaking UST within one mile of the site boundary, but both are downgradient from the landfill.

On-going remediation requirements may limit the type and location of solar and wind energy facilities. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 2.3 MW solar energy facility would fit on the 18 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be ROWs on-site. Developers should contact land managers and ROW-holders to determine the nature of on-site ROWs and what, if any, restrictions they may pose.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

The site is located within a Special Recreation Management Area, which may place limitations on development. Developers should consult with the BLM to determine allowable uses in this area.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

Site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on a landfill. For example, gas collection systems may require setbacks and other siting considerations. Technical feasibility of solar and wind developments on landfills depends on compatibility of the solar or wind systems with the existing landfill components.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #24

Name:
Fredonia OHV Area

Facts:

Acres: 348

County: Coconino

Previous Land Use: OHV recreation area

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.41N., R.2W., sec. 22, All.

0 — 100

Solar Score: 73

0 — 100

Community Wind Score: 0

0 — 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 21 MW **Wind: None**

Site Opportunities

- Site is close to transmission lines and roads
- Site is close to a load center

Site Constraints

- Managed as VRM Class III
- Special Status Species habitat
- Special Recreation Management Area
- Sensitive soils
- Only 49 percent of site exhibits slopes <5 percent

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		348
Slope <5%		170 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	45 miles
	115kV	160 miles
	230kV	47 miles
	500kV	3 miles
Active Management Area		No

Selected Environmental Factors

- Managed as VRM Class III
- Special Recreation Management Area
- Site is near transmission lines and roads
- Special Status Species habitat
- Sensitive soils
- Site is identified for disposal by BLM

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SITE #24

Remediation/Restoration Requirements

A search of federal and state records indicate the presence of one leaking underground storage tank 0.3 mile to the west of the southern edge of the site and an underground storage tank 0.2 mile from to the southwest. The Fredonia OHV area is at a higher elevation than both of these sites and would not receive contaminated groundwater flows from them. No other indications of past or present contamination is present.

Site Summary

A 21 MW solar energy facility would fit on the 170 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV and CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

The site is located within a Special Recreation Management Area, which may place limitations on development. Developers should consult with the BLM to determine allowable uses in this area.

Soil properties on this site may restrict renewable energy development. Some soil types require additional engineering requirements to support solar or wind energy infrastructure foundations. Further research through the property owner/administrator and USDA NRCS is recommended.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #25

Name:
Granite Hill Landing Strip

Facts:

Acres: 2,656

County: Pinal

Previous Land Use: Landing strip

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.7S., R.10E.

0 100

Solar Score: 85.5

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 301 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Active Management Area
* Mining claims present
* Special Status Species habitat (1,990 acres)
* AZGFD big game habitat
* Desert tortoise habitat (1,020 acres)
* Managed as VRM Class III
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	2,656
Slope <5%	2,406 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	37 miles
115kV	4 miles
230kV	13 miles
500kV	15 miles
Active Management Area	Yes

Selected Environmental Factors

- Mining claims present
- Site is near transmission lines and roads
- Managed as VRM Class III
- AZGFD big game habitat
- Special Status Species habitat (1,990 acres)
- Site is identified for disposal by BLM
- AZGFD Conservation Potential area

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SITE #25

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 301 MW solar energy facility would fit on the 2,406 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

Developers should consult with mineral estate owner/administrator regarding the potential for existing mining claims that could limit renewable energy development.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site contains AZGFD big game habitat and may be subject to mitigation requirements to protect species viability.

This site is located partially within desert tortoise habitat and developers should consult with the land management agency, if applicable, and the USFWS regarding potential mitigation and compliance measures.

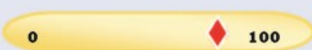
This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #26



Solar Score: 91

Site is less than 100 acres and may not be suitable for CSP technology.

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 7.4 MW **Wind: None**

Site Opportunities

- Entire site has slope of <5%
- Site is close to transmission lines and roads

Site Constraints

- Desert tortoise habitat
- Special Status Species habitat
- Managed as VRM Class III

Name:
Harcuvar Substation

Facts:

Acres: 59

County: La Paz

Previous Land Use: Substation, transmission lines

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.7N, R.12W, Sec. 17 NE1/4, NW 1/4 and Sec. 20 SE 1/4, SW 1/4.

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		59
Slope <5%		59
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	20 miles
	115kV	39 miles
	230kV	0 miles
	500kV	26 miles
Active Management Area		No

Selected Environmental Factors

- Site is near transmission lines and roads
- Managed as VRM Class III
- Special Status Species habitat
- Desert tortoise habitat
- AZGFD Conservation Potential area

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SITE #26

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 7.4 MW solar energy facility would fit on the 59 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

This site is located within desert tortoise habitat and developers should consult with the land management agency, if applicable, and the USFWS regarding potential mitigation and compliance measures.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #27

Name:
Harquahala CAP

Facts:

Acres: 1,910

County: La Paz and Maricopa

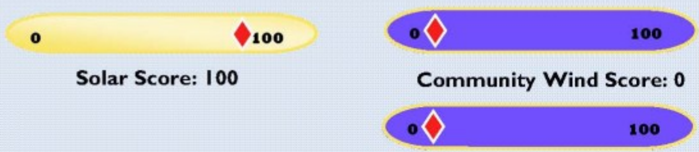
Previous Land Use: Bureau of Reclamation ROW

Adjacent Land Use: Undeveloped, Interstate 10

Surface Ownership: Bureau of Reclamation

Mineral Ownership: Federal

Legal Description: T. 3N., R.11W., sec. 15, 16, 21, 22, 23, 24 (partial sections) T. 3N., R.10W., sec 19, 20, 21,



Solar Score: 100

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 239 MW **Wind: None**

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Initial GIS screening did not identify potential site constraints. More detailed screening and site visits or surveys may identify constraints.

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		1,910
Slope <5%		1,910 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	25 miles
	115kV	55 miles
	230kV	19 miles
	500kV	0 miles
Active Management Area		No

Selected Environmental Factors

- Site is close to a load center
- Site is close to transmission lines and roads

SITE #27

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 239 MW solar energy facility would fit on the 1,910 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV and CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

These lands were originally surveyed under the NEPA process before construction of the Central Arizona Project (CAP). This includes areas identified by Reclamation as wildlife habitat areas ("green-up" areas) to be managed as mitigation for impacts from the CAP construction. Use of such areas would require consideration of mitigation for losses of wildlife habitat.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #28

Name:
Harrison Road

Facts:

Acres: 65

County: Pima

Previous Land Use: Landfill

Adjacent Land Use: Residential, un-developed

Surface Ownership: Private; State

Mineral Ownership: Private; State

Legal Description: T.14S., R.15E., sec. 34, SE.

Solar Score: 62.5 (0 – 100)

Site is less than 100 acres and may not be suitable for CSP technology.

Community Wind Score: 0 (0 – 100)

Utility Wind Score: 0 (0 – 100)

Estimated Maximum Potential Capacity[1]

Solar: 1.3 MW **Wind: None**

Site Opportunities

* Site is close to roads
* Site is close to a load center

Site Constraints

* Active Management Area
* Special Status Species habitat
* Potentially incompatible adjacent land uses
* Only 15 percent of site exhibits slopes <5 percent
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	65
Slope <5%	10 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	19 miles
115kV	9 miles
230kV	9 miles
500kV	32 miles
Active Management Area	Yes

Selected Environmental Factors

- Special Management Area
- Near urban area
- Special Status Species habitat
- Potentially incompatible adjacent land uses
- AZGFD Conservation Potential area

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SITE #28

Remediation/Restoration Requirements

Remedial action at old landfills normally includes capping of the waste, managing landfill leachate and gas, and monitoring the impact on the environment.

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks (USTs) at the site or within a quarter mile of its boundaries. The Davis Monthan Air Force Base Superfund site is directly across Irvington Avenue to the south of the Harrison Road site. From an inspection of aerial photography, these lands appear undeveloped except for a few dirt trails. Groundwater flow in the area is generally toward the northwest. None of the upgradient lands seem to have any development on them that would be related to the specific concerns related to the Superfund site.

The Garigan property is listed as a CERCLIS site, but EPA has no information on the nature of the site. Groundwater flow at the Garigan site is expected to be to the north-northeast and away from the Harrison Landfill.

Site Summary

A 1.3 MW solar energy facility would fit on the 10 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #29

Name:
Hartman Wash Mine

Facts:

Acres: 678

County: Maricopa

Previous Land Use: Mine

Adjacent Land Use: BLM site

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.7N., R.6W., sec. 27, N2, SW, N2SE, SWSE; sec. 34, N2NW.

0 100 **Solar Score: 57**

0 100 **Community Wind Score: 0**

0 100 **Utility Wind Score: 0**

Estimated Maximum Potential Capacity[1]

Solar: 1.3 MW **Wind: None**

Site Opportunities

* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Mining claim present
* Special Status Species habitat
* Managed as VRM Class II
* Desert tortoise habitat
* AZGFD wildlife corridor
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	678
Slope <5%	10 acres
Distance to Graded Road	1-2 miles
Distance to Transmission Interconnection:	
69kV	1 mile
115kV	40 miles
230kV	11 miles
500kV	3 miles
Active Management Area	No

Selected Environmental Factors

- Mining claim present
- Managed as VRM Class II
- Special Status Species habitat
- AZGFD wildlife corridor
- Desert tortoise habitat
- Site is identified for disposal by BLM
- AZGFD Conservation Potential area

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SITE #29

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 1.3 MW solar energy facility would fit on the 10 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

Developers should consult with mineral estate owner/administrator regarding the potential for existing mining claims that could limit renewable energy development.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

This site is located within desert tortoise habitat and developers should consult with the land management agency, if applicable, and the USFWS regarding potential mitigation and compliance measures.

The site is part of a wildlife corridor identified by the AZGFD and provides important habitat connectivity for certain species. Consultation with AZGFD will help determine the affected species and any necessary mitigation measures.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #30

Name:
Hassayampa Landfill

Facts:

Acres: 9

County: Maricopa

Previous Land Use: Landfill

Adjacent Land Use: Industrial, undeveloped

Surface Ownership: Private

Mineral Ownership: Private, state

Legal Description: T.1S., R.5W., sec. 3, S2

0 100

Solar Score: 89

Site is less than 100 acres and may not be suitable for CSP technology.

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 1 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Special Status Species habitat

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		9
Slope <5%		8 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	6 miles
	115kV	29 miles
	230kV	9 miles
	500kV	3 miles
Active Management Area		Yes

Selected Environmental Factors

- Site is near transmission lines and roads
- Special Status Species habitat
- Near load center

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SITE #30

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past underground storage tanks at the site or within a quarter mile of its boundaries.

As of 1986, on-site monitoring wells were contaminated with chlorinated organic solvents, including 1,1,1-trichloroethane and trichloroethylene, according to tests conducted by the Arizona Department of Health Services (ADHS). At that time, contamination had not been detected in off-site wells. The landfill was then listed on the NPL in 1987. Cleanup actions were initiated in 1994 and completed in 1997. The site has not yet been deleted from the NPL. Supporting maps and reports are attached.

Since cleanup work has been completed at the site, but the site has not been removed from the NPL, it is possible that residual groundwater contamination with the above-mentioned substances is present. Soil vapors may be present during construction activities, and vapor intrusion into the landfill may be present. Coordination with the EPA and AZDEQ is recommended before construction activity at the site.

Site Summary

A 1 MW solar energy facility would fit on the 8 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on a landfill. For example, gas collection systems may require setbacks and other siting considerations. Technical feasibility of solar and wind developments on landfills depends on compatibility of the solar or wind systems with the existing landfill components.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #31

0 100
Solar Score: 94.5

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 90 MW **Wind: None**

Name:
Hassayampa CAP

Facts:

Acres: 723

County: Maricopa

Previous Land Use: Bureau of Reclamation ROW

Adjacent Land Use: Undeveloped, Residential

Surface Ownership: Bureau of Reclamation

Mineral Ownership: Federal

Legal Description: T. 4N., R.4W. Sec. 13, 21, 22, 23, 24 (partial sections).

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Near urban area
* Special status species habitat

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	723
Slope <5%	720 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	8 miles
115kV	20 miles
230kV	1 miles
500kV	0 miles
Active Management Area	Yes

Selected Environmental Factors

- Site is close to a load center
- Special Status Species habitat

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SITE #31

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 720 MW solar energy facility would fit on the 720 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV and CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

These lands were originally surveyed under the NEPA process before construction of the Central Arizona Project (CAP). This includes areas identified by Reclamation as wildlife habitat areas ("green-up" areas) to be managed as mitigation for impacts from the CAP construction. Use of such areas would require consideration of mitigation for losses of wildlife habitat.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #32

Name:
Irvington

Facts:

Acres: 13

County: Pima

Previous Land Use: Landfill

Adjacent Land Use: Residential, undeveloped

Surface Ownership: Private, state

Mineral Ownership: Private, state

Legal Description: T.15S., R.15E., sec. 2, Lot 2

0 100

Solar Score: 78

Site is less than 100 acres and may not be suitable for CSP technology.

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 1.1 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Special Status Species habitat
* Potentially incompatible adjacent land uses

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		13
Slope <5%		9 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	18 miles
	115kV	8 miles
	230kV	9 miles
	500kV	33 miles
Active Management Area		Yes

Selected Environmental Factors

- Near urban area
- Special Status Species habitat
- Site is close to transmission lines and roads

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SITE #32

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks (USTs) at the site. The nearest USTs are at 0.2, 0.35 and 0.4 mile to the northeast. There are no leaking USTs within 0.5 mile of the site. Davis Monthan Air Force Base, a Superfund site, is 0.5 mile to the west. Groundwater flow in the area is generally toward the north; none of the aforementioned sites would impact groundwater at the Irvington Landfill.

Global Solar Energy, located 0.8 mile to the southeast and upgradient from the Irvington site, has a record of releasing lead to underground wells and to an onsite landfill during years 2003 through 2006. Lead could be present in groundwater underlying the Irvington Landfill but would not be a concern since a thick layer of solid waste and a soil cap is presumed to overly such groundwater. Also, lead in groundwater does not pose an inhalation hazard as it is not a volatile compound.

Site Summary

A 1.1 MW solar energy facility would fit on the 9 acres of land with a slope of <5%. Size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #33

0 100
Solar Score: 85

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 19.5 MW **Wind: None**

Name:
Jones Private Property

Facts:

Acres: 156

County: Cochise

Previous Land Use: Agricultural

Adjacent Land Use: Undeveloped

Surface Ownership: Private

Mineral Ownership: Private; State

Legal Description: T.24S., R.22E., sec. 16, NW.

Site Opportunities

* Entire site has slope of <5%
* Site is close to a load center

Site Constraints

* Special Status Species habitat
* AZGFD big game habitat
* Distance to transmission interconnect
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		156
Slope <5%		156 acres
Distance to Graded Road		1-2 miles
Distance to Transmission Interconnection:		
	69kV	14 miles
	115kV	14 miles
	230kV	13 miles
	500kV	100 miles
Active Management Area		No

Selected Environmental Factors

- Potential mining claims
- AZGFD big game habitat
- Special Status Species habitat
- AZGFD Conservation Potential area

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SITE #33

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 19.5 MW solar energy facility would fit on the 156 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

The distance to transmission lines may make interconnection less cost-efficient.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #34

Name:
La Osa Surface Disturbance

Facts:

Acres: 41

County: Pinal

Previous Land Use: n/a

Adjacent Land Use: Undeveloped

Surface Ownership: Private

Mineral Ownership: Private

Legal Description: T.15S., R.12E., sec. 17, SWSE.

0 100

Solar Score: 88

Site is less than 100 acres and may not be suitable for CSP technology.

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 5.1 MW **Wind: None**

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Special Status Species habitat (24 acres)
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	41
Slope <5%	41 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	26 miles
115kV	8 miles
230kV	1 mile
500kV	8 miles
Active Management Area	Yes

Selected Environmental Factors

- AZGFD Conservation Potential area
- Special Status Species habitat (24 acres)

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SITE #34

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 5.1 MW solar energy facility would fit on the 41 acres of land with a slope of <5%. Size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

This location is known to be near sensitive cultural resources. Documentation of the cultural resources would be required and avoidance of impacts to these areas would be considered in reviewing any applications for development.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #35

Name:
Litchfield Park Urban Parcel

Facts:

Acres: 41

County: Maricopa

Previous Land Use: Disturbed area

Adjacent Land Use: Industrial, undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.2.N., R.1W., sec. 13, SWSE; sec. 24, NWNE; sec. 25, NWNE.

0 100
Solar Score: 97

Site is less than 100 acres and may not be suitable for CSP technology.

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 5.1 MW **Wind: None**

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	41
Slope <5%	41 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	3 miles
115kV	3 miles
230kV	0 miles
500kV	7 miles
Active Management Area	Yes

Selected Environmental Factors

- Rights of way present
- Part of site identified for disposal by BLM

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SITE #35

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 5.1 MW solar energy facility would fit on the 41 acres of land with a slope of <5%. Size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #36

0 100
Solar Score: 86

0 100
Community Wind Score: 86

0 100
Utility Wind Score: 86

Estimated Maximum Potential Capacity[1]

Solar: 16.4 MW **Wind: None**

Site Opportunities

- Majority of site has slope of <5%
- Site is close to transmission lines and roads
- Minimal environmental constraints

Site Constraints

- Desert tortoise habitat
- Managed as VRM Class III
- CAP pumping station located on site
- AZGFD Species and Habitat Conservation Guide Conservation Potential

Name:
Little Harquahala CAP Site

Facts:

Acres: 159

County: La Paz

Previous Land Use: CAP ROW

Adjacent Land Use: Arizona Canal, undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.3N., R.13W., sec. 18, Lots 3-4, SE, E2SW; sec. 19, Lots 1-2, NE, E2NW.

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		159
Slope <5%		131 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	35 miles
	115kV	43 miles
	230kV	24 miles
	500kV	4 miles
Active Management Area		No

Selected Environmental Factors

- ROW present
- Managed as VRM Class III
- Desert tortoise Habitat
- Canal on site
- AZGFD Conservation Potential area

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Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #36

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 16.4 MW solar energy facility would fit on the 131 acres of land with a slope of <5%. Size of developable acreage would likely make the site suitable for PV or CSP technology.

This site is located within desert tortoise habitat and developers should consult with the BLM and the USFWS regarding potential mitigation and compliance measures.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

A CAP pumping station is located on the site and may inhibit development of portions of tis site.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #37

Solar Score: 88.5

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 28 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Special Status Species habitat
* Potentially incompatible adjacent land uses

Name:
Los Reales

Facts:

Acres: 248

County: Pima

Previous Land Use: Landfill

Adjacent Land Use: Residential, commercial, undeveloped

Surface Ownership: Private

Mineral Ownership: Private; State

Legal Description: T.15S., R.14E., sec. 23, N2.

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	248
Slope <5%	225 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	21 mile
115kV	3 miles
230kV	6 miles
500kV	34 miles
Active Management Area	Yes

Selected Environmental Factors

- Active Management Area
- Near urban area and load center
- Special Status Species habitat

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SITE #37

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 28 MW solar energy facility would fit on the 225 acres of land with a slope of <5%. Size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.
The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #38

Name:
Mobile Proposed Disposal

Facts:

Acres: 2,843

County: Maricopa

Previous Land Use: Undeveloped

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: Unknown

Legal Description: T.4S., R.1E., sec. 34, E2; sec. 35, W2

Solar Score: 91.5

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 347 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Active Management Area
* Includes 570 acres of AZGFD wildlife corridors

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		2,843
Slope <5%		2,776 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	27 mile
	115kV	12 miles
	230kV	13 miles
	500kV	0 miles
Active Management Area		Yes

Selected Environmental Factors

- Rights-of-way present
- Active Management Area
- Partially within AZGFD wildlife corridors
- Site is identified for disposal by BLM

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SITE #38

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of USTs at the site or within a quarter mile of its boundaries.

Site Summary

A 347 MW solar energy facility would fit on the 2,776 acres of land with a slope of <5%. Size of developable acreage would likely make the site suitable for PV or CSP technology.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site is part of a wildlife corridor identified by the AZGFD and provides important habitat connectivity for certain species. Consultation with AZGFD will help determine the affected species and any necessary mitigation measures.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #39

Name:
Mokaac Gravel Pit

Facts:

Acres: 80

County: Mohave

Previous Land Use: Gravel pit

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.41N., R.12W., sec. 23, W2SW

0 100
Solar Score: 88.5

Site is less than 100 acres and may not be suitable for CSP technology.

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 9.8 MW **Wind: None**

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	80
Slope <5%	78 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	97 miles
115kV	164 miles
230kV	107 miles
500kV	0.1 miles
Active Management Area	No

Selected Environmental Factors

- Right-of-ways present
- Portion of site managed as VRM Class II
- Special Recreation Management Area
- Special Status Species

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads

Site Constraints

* Special Recreation Management Area
* Special Status Species Habitat
* Site has 17 acres managed as VRM Class II

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SITE #39

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 9.8 MW solar energy facility would fit on the 78 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #40

Solar Score: 91.5

Site is less than 100 acres and may not be suitable for CSP technology.

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 3.3 MW **Wind: None**

Name:
Old Yuma County FUP Site

Facts:

Acres: 27

County: Yuma

Previous Land Use: Mineral Material

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: BLM

Legal Description: T.8S., R.14W., sec. 7, NW.

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads

Site Constraints

* Managed as VRM Class II and III
* Special Recreation Management Area
* ROW exclusion or avoidance area

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		27
Slope <5%		26 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	30 miles
	115kV	42 miles
	230kV	2 miles
	500kV	5 miles
Active Management Area		No

Selected Environmental Factors

- Managed as VRM Class II and III
- Special Recreation Management Area
- ROW exclusion or avoidance area

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SITE #40

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 3.3 MW solar energy facility would fit on the 26 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

This site is located within a ROW exclusion or avoidance area. As such, ROWs may be restricted or prohibited. Developers should consult with the BLM to determine the feasibility of ROW development on this site.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #41

Name:
Page Landfill

Facts:

Acres: 160

County: Coconino

Previous Land Use: Landfill

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.41N, R.8E., sec 20, NW.

0 100
Solar Score: 97

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 20 MW **Wind: None**

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		160
Slope <5%		160 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	0 miles
	115kV	169 miles
	230kV	0.3 miles
	500kV	0.1 miles
Active Management Area		No

Selected Environmental Factors

- Right-of-ways present
- Managed as VRM Class II and III
- Special Recreation Management Area

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Managed as VRM Class II and III
* Special Recreation Management Area

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SITE #41

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 20 MW solar energy facility would fit on the 160 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

Site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on a landfill. For example, gas collection systems may require setbacks and other siting considerations. Technical feasibility of solar and wind developments on landfills depends on compatibility of the solar or wind systems with the existing landfill components.

Restoration Design Energy Project
Environmental Impact Statement—Nominated Sites Summary

SITE #42

Name:
Prudence

Facts:

Acres: 9

County: Pima

Previous Land Use: Landfill

Adjacent Land Use: Residential, Pantano Wash

Surface Ownership: Private

Mineral Ownership: Private

Legal Description: T.14S., R.15E., sec. 17, NWSE.

Solar Score: 81

Site is less than 100 acres and may not be suitable for CSP technology.

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 0.8 MW **Wind: None**

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		9
Slope <5%		6 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	23 mile
	115kV	10 miles
	230kV	13 miles
	500kV	28 miles
Active Management Area		Yes

Selected Environmental Factors

- Active Management Area
- Near urban area
- Special Status Species habitat

Site Opportunities

* Majority of site has slope of <5%
* Site is close to roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Special Status Species Habitat
* Potentially incompatible adjacent land uses

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SITE #42

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of USTs at the site. A portion of the Broadway-Pantano Superfund site, which is on the WQARF Registry, is 0.2 mile to the north of the Prudence Landfill. No other sources of contamination were identified within 0.25 mile of the site, but when looking out to 0.5 mile, several sources exist, per the summary table below. Supporting maps and reports are attached.

The Broadway-Pantano Site consists of the Broadway North Landfill (BNL) the Broadway South Landfill (BSL), and the groundwater contamination associated with both landfills. Groundwater at the site is contaminated with tetrachloroethene (PCE), trichloroethene (TCE) and vinyl chloride occurring over regulatory limits. Other contamination is buried metal waste (dross) at the far southern section of the BNL (closest to the Prudence Landfill). Depth to groundwater is about 340 feet below ground surface. More information on the Broadway-Pantano site is provided in the attached WQARF files. Given the presence of the Pantano Wash immediately to the east of both the Broadway-Pantano site and the Prudence Landfill, groundwater flow in both cases is expected to be toward the east. Groundwater contamination from Broadway-Pantano site is not expected to underlie the Prudence Landfill; likewise, TCE and PCE vapors from the Broadway-Pantano site are not considered to be a concern within the Prudence Landfill footprint. Regardless, any development on the Prudence Landfill would be on the landfill's soil cap, which would not be subject to groundwater flow.

Site Summary

A 0.8 MW solar energy facility would fit on the 6 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #43

Name:
Quartzsite Area

Facts:

Acres: 22,131

County: La Paz

Previous Land Use: Agricultural

Adjacent Land Use: Undeveloped

Surface Ownership: State

Mineral Ownership: State

Legal Description: T.6N., R.19W., T.7N., R.19W.

0 100
Solar Score: 85.5

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 2,711 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Sensitive soils
* Includes 18,840 acres within Special Status Species habitat

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		22,131
Slope <5%		21,689 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	24 mile
	115kV	3 miles
	230kV	16 miles
	500kV	20 miles
Active Management Area		No

Selected Environmental Factors

- Potential mining claims and rights of way
- Partially within Special Status Species habitat
- Sensitive soils

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SITE #43

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries. La Paz County Regional Landfill is adjacent to the northeast corner of the Quartzsite site (ADEQ has classified this as a Municipal Landfill); however, the Quartzsite Area is upgradient from the landfill and no effects to soil or groundwater from the landfill would be present.

Site Summary

A 2,711 MW solar energy facility would fit on the 21,689 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

Soil properties on this site may restrict renewable energy development. Some soil types require additional engineering requirements to support solar or wind energy infrastructure foundations. Further research through the property owner/administrator and USDA NRCS is recommended.

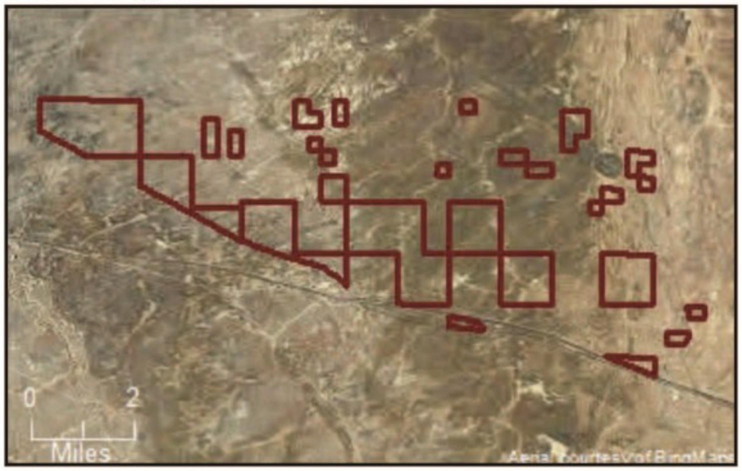
There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #44



0 100
Solar Score: 100

0 100
Community Wind Score: 60

0 100
Utility Wind Score: 76

Estimated Maximum Potential Capacity[1]

Solar: 998 MW **Wind: 61 MW**

Site Opportunities

* Majority of site has slope of <5%
* "Fair" wind potential rating on 1,700 acres
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Potential wetlands on 14 acres
* Sensitive soils on 5,316 acres

Name:
Red Gap Ranch

Facts:

Acres: 7,985

County: Coconino

Jurisdiction: N/A

Previous Land Use: N/A

Adjacent Land Use: Undeveloped

Surface Ownership: Private and state

Mineral Ownership: N/A

Legal Description: N/A

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		Fair
Acres		7,985
Slope <5%		7,983 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	0 miles
	115kV	87 miles
	230kV	5 miles
	500kV	29 miles
Active Management Area		No

Selected Environmental Factors

- Near load center
- Special status species
- Salt River Channel on site

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SITE #44

Remediation/Restoration Requirements

A search of federal and state records indicate two leaking underground storage tanks (LUSTs) within approximately 0.25 mile of the southern edge of a portion of the site. These LUSTs are upgradient from portions of the site and could have associated groundwater contamination plumes present; however, AZDEQ records shown that both of these investigations are closed, presumably indicating that all clean up actions have been completed. Applicants should verify with AZDEQ the worker health and safety implications of closed LUST sites upgradient from this property. Federal and state records show no other present or past contamination or presence of underground storage tanks (USTs) at the site or within a quarter mile of its boundaries.

Site Summary

A 998 MW solar energy facility would fit on the 7,983 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

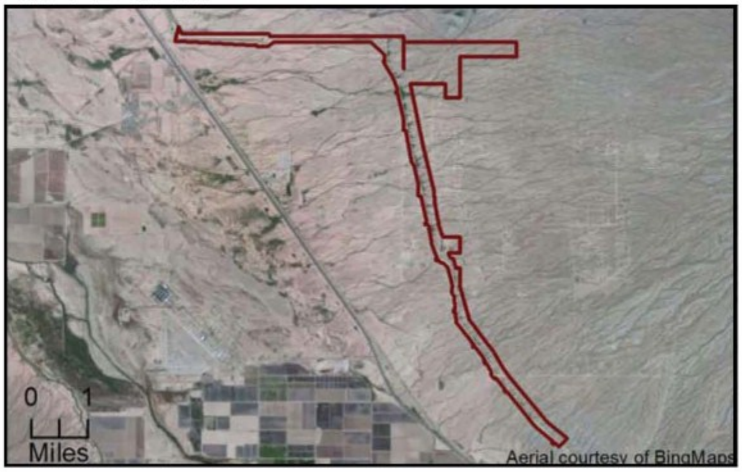
There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

A small (14-acre) portion of this site may contain wetlands. If field-verified, development would need to avoid this area. Consultation with USFWS is recommended to determine appropriate mitigation and avoidance techniques.

Soil properties on this site may restrict renewable energy development. Some soil types require additional engineering requirements to support solar or wind energy infrastructure foundations. Further research through the property owner/administrator and USDA NRCS is recommended.

Restoration Design Energy Project
Environmental Impact Statement—Nominated Sites Summary

SITE #45



0 100

Solar Score: 82.5

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 276 MW **Wind: None**

Name:
Red Rocks CAP

Facts:

Acres: 2,213

County: Pima and Pinal

Previous Land Use: Bureau of Reclamation ROW

Adjacent Land Use: Undeveloped, transportation

Surface Ownership: Bureau of Reclamation/BLM

Mineral Ownership: Federal

Legal Description: T. 4N., R.4W. Sec. 13, 21, 22, 23, 24 (partial sections).

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Arizona Game and Fish Department Conservation Potential
* Desert tortoise habitat
* AGFD big game habitat
* Special Status Species habitat
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	2,213
Slope <5%	2,210 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	2 miles
115kV	0 miles
230kV	2 miles
500kV	0 miles
Active Management Area	Yes

Selected Environmental Factors

- Site is close to a load center
- Arizona Game and Fish Department Conservation Potential
- Special Status Species Habitat
- AZGFD Conservation Potential area

SITE #45

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 276 MW solar energy facility would fit on the 2,210 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV and CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site is located within desert tortoise habitat and developers should consult with the land management agency, if applicable, and the USFWS regarding potential mitigation and compliance measures.

This site contains AZGFD big game habitat and may be subject to mitigation requirements to protect species viability.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

These lands were originally surveyed under the NEPA process before construction of the Central Arizona Project (CAP). This includes areas identified by Reclamation as wildlife habitat areas ("green-up" areas) to be managed as mitigation for impacts from the CAP construction. Use of such areas would require consideration of mitigation for losses of wildlife habitat.

Restoration Design Energy Project
Environmental Impact Statement—Nominated Sites Summary

SITE #46

Name:
Ryan

Facts:

Acres: 16

County: Pima

Jurisdiction: Private

Previous Land Use: Landfill

Adjacent Land Use: Airport

Surface Ownership: Private

Mineral Ownership: Private

Legal Description: T.15S., R.12E., sec. 7, Lot 2

Solar Score: 94

Site is less than 100 acres and may not be suitable for CSP technology.

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 2 MW **Wind: None**

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		16
Slope <5%		16 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	37 miles
	115kV	5 miles
	230kV	16 miles
	500kV	29 miles
Active Management Area		Yes

Selected Environmental Factors

- Near urban area
- Special status species
- Compatible surrounding land use

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Special Status Species Habitat
* Potentially compatible adjacent land uses

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SITE #46

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 2 MW solar energy facility would fit on the 16 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #47

Name:
Ryland

Facts:

Acres: 27

County: Pima

Jurisdiction: Private

Previous Land Use: Landfill

Adjacent Land Use: Residential and undeveloped

Surface Ownership: Private

Mineral Ownership: Private

Legal Description: T.14S., R.13E., sec. 26, SENW

0 100

Solar Score: 85

Site is less than 100 acres and may not be suitable for CSP technology.

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 3.4 MW **Wind: None**

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is within a load center

Site Constraints

* Active Management Area
* Special Status Species Habitat
* Site has 7 acres of potential wetlands
* Potentially incompatible adjacent land uses
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic		**Description**
Solar Potential		Good
Wind Potential		None
Acres		27
Slope <5%		27 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	29 miles
	115kV	2 miles
	230kV	11 miles
	500kV	28 miles
Active Management Area		Yes

Selected Environmental Factors

- Urban area
- Special status species
- AZGFD Conservation Potential area

SITE #47

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 3.4 MW solar energy facility would fit on the 27 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

A 7-acre portion of this site may contain wetlands. If field-verified, development would need to avoid this area. Consultation with USFWS is recommended to determine appropriate mitigation and avoidance techniques.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Restoration Design Energy Project
Environmental Impact Statement—Nominated Sites Summary

SITE #48

Name:
Saginaw-Valhalla-Snyder Mine and Quarry

Facts:

Acres: 997

County: Pima

Jurisdiction: BLM

Previous Land Use: Undeveloped

Adjacent Land Use: Residential, undeveloped, commercial

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.15S., R.12E., sec. 11, E2NE, NWNE, N2 SWNE, SESWNE, SE; sec. 12, Lots 5-12, W2, N2SE, SWSE; T.15S., R.12E., sec. 3, Lots 9-16, SWNW; sec. 4, Lots 1 and 9-10, S2NENE, SENE; T.15S., R.12E., sec. 20, S2NW, SW, S2SE.

0 100
Solar Score: 83

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 107 MW **Wind: None**

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	997
Slope <5%	856 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	33 miles
115kV	0.1 miles
230kV	12 miles
500kV	28 miles
Active Management Area	Yes

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center

Selected Environmental Factors

- Site is managed as VRM Class III
- Special status species habitat
- Site has 310 acres of desert tortoise habitat
- Nominated for disposal by BLM
- AZGFD Conservation Potential area

Site Constraints

* Active Management Area
* Special Status Species Habitat
* Site has 310 acres of desert tortoise habitat
* Site has 973 acres managed as VRM Class III
* Potentially incompatible adjacent land uses
* AZGFD Species and Habitat Conservation Guide Conservation Potential

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SITE #48

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 107 MW solar energy facility would fit on the 856 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site is located partially within desert tortoise habitat and developers should consult with the land management agency, if applicable, and the USFWS regarding potential mitigation and compliance measures.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #49

Name:
Saginaw Hill

Facts:

Acres: 503

County: Pima

Jurisdiction: BLM

Previous Land Use: Undeveloped

Adjacent Land Use: Residential and undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.15S., R.12E., sec. 11, E2NE, NWNE, N2 SWNE, SESWNE, SE; sec. 12, Lots 5-12, W2, N2SE, SWSE

0 100
Solar Score: 89

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 54 MW **Wind: None**

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	503
Slope <5%	433 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	33 miles
115kV	0.1 miles
230kV	12 miles
500kV	28 miles
Active Management Area	Yes

Site Opportunities

* Solar potential rating of Good on entire site
* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Active Management Area
* Special Status Species Habitat
* Site is managed as VRM Class III
* Potentially incompatible adjacent land uses

Selected Environmental Factors

* Near urban area
* Special status species habitat
* Site is managed as VRM Class III
* Potentially incompatible adjacent land uses

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SITE #49

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 54 MW solar energy facility would fit on the 533 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

Restoration Design Energy Project
Environmental Impact Statement—Nominated Sites Summary

SITE #50

Name:
San Xavier Mine

Facts:

Acres: 2,573

County: Pima

Jurisdiction: Tohono O'odham

Previous Land Use: Mine

Adjacent Land Use: Industrial and undeveloped

Surface Ownership: Reservation

Mineral Ownership: Reservation

Legal Description: T.16S., R.13E., sec. 20, E2; sec. 21, All; sec. 28, All; sec. 30, E2

Solar Score: 86

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 275 MW **Wind: None**

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		2,573
Slope <5%		2,198 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	26 miles
	115kV	5 miles
	230kV	5 miles
	500kV	38 miles
Active Management Area		Yes

Selected Environmental Factors

- Near urban area
- Special status species habitat
- Close to transmission and roads

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Special Status Species Habitat
* Portions of site may be contaminated

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SITE #50

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 275 MW solar energy facility would fit on the 2,198 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

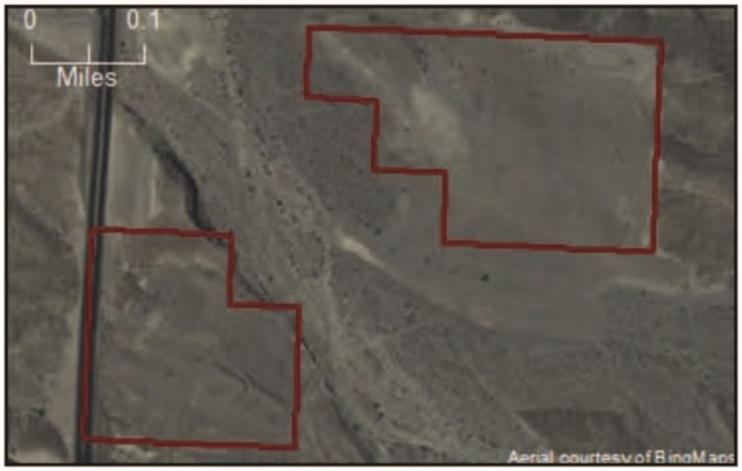
As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #51



0 100

Solar Score: 65.5

Site is less than 100 acres and may not be suitable for CSP technology.

0 100

Community Wind Score: 37.5

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 1.1 MW **Wind: 0.4 MW**

Name:
Silver Creek Landfill

Facts:

Acres: 50

County: Mohave

Jurisdiction: BLM

Previous Land Use: Landfill

Adjacent Land Use: Vacant and residential

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.20N., R.21W

Site Opportunities

* Wind potential rating of "Fair" on 11 acres
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Only 9 acres exhibits slope less than 5 percent
* Special Status Species Habitat
* Desert tortoise habitat
* Potentially incompatible adjacent land uses

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	Fair
Acres	50
Slope <5%	9 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	6 miles
115kV	63 miles
230kV	0.3 miles
500kV	38 miles
Active Management Area	No

Selected Environmental Factors

- Near urban area
- Special status species habitat
- Desert tortoise habitat
- Near 230kV line

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SITE #51

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 1.1 MW solar energy facility would fit on the 9 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site is located within desert tortoise habitat and developers should consult with the land management agency, if applicable, and the USFWS regarding potential mitigation and compliance measures.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

Site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on a landfill. For example, gas collection systems may require setbacks and other siting considerations. Technical feasibility of solar and wind developments on landfills depends on compatibility of the solar or wind systems with the existing landfill components.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #52

Solar Score: 91

Site is less than 100 acres and may not be suitable for CSP technology.

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 4.5 MW **Wind: None**

Name:
Silverbell

Facts:

Acres: 36

County: Pima

Jurisdiction: City of Tucson

Previous Land Use: Landfill

Adjacent Land Use: Mixed (Urban)

Surface Ownership: Private

Mineral Ownership: Private

Legal Description: T.13S., R.13E., sec. 28, W2SE; sec. 33, NENE

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Active Management Area
* Special Status Species Habitat
* Site is within 0.25-mile of National Historic Trail
* Potentially incompatible adjacent land uses

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		36
Slope <5%		36 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	33 miles
	115kV	0 miles
	230kV	17 miles
	500kV	23 miles
Active Management Area		Yes

Selected Environmental Factors

- In urban area
- Special status species habitat
- Within 0.25-mile of National Historic Trail

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SITE #52

Remediation/Restoration Requirements

The site is a closed municipal solid waste landfill and is classified by the EPA as a Superfund site. Silverbell is listed on the WQARF Registry. Sites placed on the Registry are scored using an approved eligibility and evaluation (E&E) model for evaluating risk and other environmental factors. The Silverbell site has an E&E score of 51 out of a possible total score of 120. The attached WQARF reports provide detailed information on the site and its environmental issues.

Seven leaking underground storage tanks are reported to occur within 0.5 mile of the site. There are no brownfields within 0.5 mile. Supporting maps and reports are attached. Due to the composition of the site as a landfill, any earth-disturbing activities on the site would be on a soil cap, which would not be subject to contamination from migrating groundwater.

Four CERCLIS/Superfund sites exist within one mile of the site; however, groundwater contamination is not expected to be a concern given the soil cap on the landfill.

Site Summary

A 4.5 MW solar energy facility would fit on the 36 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #53

Solar Score: 71

Site is less than 100 acres and may not be suitable for CSP technology.

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 0.9 MW **Wind: None**

Name:
Snowflake Mine

Facts:

Acres: 24

County: Mohave

Jurisdiction: BLM

Previous Land Use: Mine

Adjacent Land Use: Commercial

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.41N., R.13W., sec. 25, NW1/4

Site Opportunities

* Site is close to roads and 500kV transmission line

Site Constraints

* Special Status Species Habitat
* Special Recreation Management Area
* Only 29 percent of site exhibits slope of <5 percent

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		24
Slope <5%		7 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	98 miles
	115kV	166 miles
	230kV	112 miles
	500kV	2 miles
Active Management Area		No

Selected Environmental Factors

- Near 500kV line
- Special status species habitat
- Remote location

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SITE #53

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 0.9 MW solar energy facility would fit on the 7 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

The nearby transmission line may offer cost-efficient opportunities for interconnection.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

The site is located within a Special Recreation Management Area, which may place limitations on development. Developers should consult with the BLM to determine allowable uses in this area.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #54

0 100

Solar Score: 89

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 19 MW **Wind: None**

Name:
Snyder Hill Mine

Facts:

Acres: 176

County: Pima

Jurisdiction: BLM

Previous Land Use: Mine

Adjacent Land Use: Undeveloped

Surface Ownership: BLM

Mineral Ownership: BLM

Legal Description: T.15S., R.12E., sec. 3, Lots 9-16, SWNW; sec. 4, Lots 1 and 9-10, S2NENE, SENE

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Active Management Area
* Special Status Species Habitat
* Desert tortoise habitat
* Site is managed as VRM Class III

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		176
Slope <5%		151 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	33 miles
	115kV	0.1 miles
	230kV	12 miles
	500kV	28 miles
Active Management Area		Yes

Selected Environmental Factors

- Site is managed as VRM Class III
- Special status species habitat
- Desert tortoise habitat
- Near urban area

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SITE #54

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 19 MW solar energy facility would fit on the 188 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site is located partially within desert tortoise habitat and developers should consult with the land management agency, if applicable, and the USFWS regarding potential mitigation and compliance measures.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #55

Name:
Sonoita Landfill

Facts:

Acres: 39

County: Santa Cruz

Jurisdiction: BLM

Previous Land Use: Landfill

Adjacent Land Use: BLM-administered lands

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.1N, R.3E, sec. 19, Lots 1-3, E2NW, NESW

0 100

Solar Score: 85.5

Site is less than 100 acres and may not be suitable for CSP technology.

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 4.5 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to roads
* Site is close to a load center

Site Constraints

* Site is far from transmission lines
* Status Species Habitat
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		39
Slope <5%		36 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	15 miles
	115kV	9 miles
	230kV	20 miles
	500kV	67 miles
Active Management Area		No

Selected Environmental Factors

- Near load center
- Special status species habitat
- Wash on site
- Part of site identified for disposal by BLM
- AZGFD Conservation Potential area

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SITE #55

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 4.5 MW solar energy facility would fit on the 36 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on a landfill. For example, gas collection systems may require setbacks and other siting considerations. Technical feasibility of solar and wind developments on landfills depends on compatibility of the solar or wind systems with the existing landfill components.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #56

Name:
St. Mary's

Facts:

Acres: 10

County: Pima

Jurisdiction: Private

Previous Land Use: Landfill

Adjacent Land Use: Commercial and residential

Surface Ownership: Private

Mineral Ownership: Private

Legal Description: n/a

0 100
Solar Score: 91

Site is less than 100 acres and may not be suitable for CSP technology.

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 1.3 MW **Wind: None**

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	10
Slope <5%	10 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	1 mile
115kV	3 miles
230kV	2 miles
500kV	14 miles
Active Management Area	Yes

Selected Environmental Factors

- In urban area
- Special status species habitat
- Close proximity to transmission and roads
- Surrounded by residential and commercial development

Site Opportunities

* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is within a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Special Status Species Habitat
* Potentially incompatible adjacent land uses

SITE #56

Remediation/Restoration Requirements

Drainage is expected to be to the east toward the Santa Cruz River. A search of federal and state records indicate the presence of one or two leaking underground storage tanks approximately 0.4 to 0.5 miles to the east of the site, rendering them potentially upgradient in terms of groundwater flow. Groundwater plumes could have resulted in contamination of groundwater under the landfill. Contaminated groundwater underlying a landfill could result in soil vapor intrusion into enclosed spaces within the landfill and could pose a potential hazard to workers that may excavate into the solid waste contained therein.

Site Summary

A 1.3 MW solar energy facility would fit on the 10 acres of land with a slope of <5%. Size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #57

Name:
Tombstone Landfill

Facts:

Acres: 43

County: Cochise

Jurisdiction: BLM

Previous Land Use: Landfill

Adjacent Land Use: Commercial

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.19S., R.22E

Solar Score: 83.5

Site is less than 100 acres and may not be suitable for CSP technology.

Community Wind Score: 0

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 4.1 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints
* BLM parcel nominated for disposal

Site Constraints

* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		43
Slope <5%		33 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	0 miles
	115kV	5 miles
	230kV	3 miles
	500kV	79 miles
Active Management Area		No

Selected Environmental Factors

- Near urban area
- Close proximity to transmission and roads
- BLM parcel nominated for disposal
- Part of site identified for disposal by BLM
- AZGFD Conservation Potential area

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SITE #57

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

If future surveys reveal any contamination, the type and location of solar and wind energy facilities may be limited. For example, construction of solar and wind plants may entail significant excavation of contaminated soil, or site development may involve extensive hardscaping, which may serve as a cap to prevent further migration of contamination. In some cases, removal of contaminated soils and prevention of any additional ground water contamination may suffice as a remedial effort.

Site Summary

A 4.1 MW solar energy facility would fit on the 33 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

Site characteristics may impose restrictions on the type and amount of renewable energy that can be developed on a landfill. For example, gas collection systems may require setbacks and other siting considerations. Technical feasibility of solar and wind developments on landfills depends on compatibility of the solar or wind systems with the existing landfill components.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #58

Name:
Torrez-Brant

Facts:

Acres: 408

County: Maricopa

Jurisdiction: Private

Previous Land Use: Agricultural

Adjacent Land Use: Agricultural

Surface Ownership: Private

Mineral Ownership: Private, State

Legal Description: T.4S., R.10W., sec. 4, W2, SE, W2 NE

0 100
Solar Score: 97

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 51 MW **Wind: None**

Site Opportunities

* Solar potential rating of Good on entire site
* Entire site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Initial GIS screening did not identify potential site constraints. More detailed screening and site visits or surveys may identify constraints.

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		408
Slope <5%		408 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	4 miles
	115kV	67 miles
	230kV	17 miles
	500kV	3 miles
Active Management Area		No

Selected Environmental Factors

- Near load center
- Entire site rated Good for solar
- Surrounded by agricultural and undeveloped land

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Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #58

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 51 MW solar energy facility would fit on the 408 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #59

Name:
Tumamoc

Facts:

Acres: 21

County: Pima

Jurisdiction: Private

Previous Land Use: Landfill

Adjacent Land Use: Residential, open space

Surface Ownership: Private

Mineral Ownership: Federal

Legal Description: T.14S., R13E., sec. 16, SESE

0 100
Solar Score: 73.5

Site is less than 100 acres and may not be suitable for CSP technology.

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 0.9 MW **Wind: None**

Site Opportunities

* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Special Status Species habitat
* Only 33 percent of site exhibits slope of <5 percent

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		21
Slope <5%		7 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	31 miles
	115kV	0 miles
	230kV	13 miles
	500kV	27 miles
Active Management Area		Yes

Selected Environmental Factors

- In urban area
- Special status species habitat
- Nearby residential development
- Close proximity to transmission and roads

SITE #59

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 0.9 MW solar energy facility would fit on the 7 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #60

Name:
Twin Peaks-Sandario CAP

Facts:

Acres: 888

County: Pima

Previous Land Use: Bureau of Reclamation ROW

Adjacent Land Use: Residential, mining

Surface Ownership: Bureau of Reclamation

Mineral Ownership: Federal

Legal Description: T.12S., R.11E., secs 14, 15, 23, 26, 27, 28, 32, 33 T.13S., R.11E., sec. 5, 6, 7, 8 (all partial sections).

0 100
Solar Score: 88.5

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 109 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Arizona Game and Fish Department Conservation Potential
* AGFD big game habitat
* Special Status Species habitat
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	888
Slope <5%	870 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	0 miles
115kV	0 miles
230kV	13 miles
500kV	12 miles
Active Management Area	Yes

Selected Environmental Factors

- Site is close to a load center
- Arizona Game and Fish Department Conservation Potential
- Special Status Species habitat
- AZGFD Conservation Potential area

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SITE #60

Remediation/Restoration Requirements

A search of federal and state records indicate one underground storage tank (UST) approximately 0.25-mile to the west of the site. This UST is not reported as leaking. Records provide no indication of present or past contamination at the site or within a quarter mile of its boundaries.

Site Summary

A 109 MW solar energy facility would fit on the 870 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV and CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site contains AZGFD big game habitat and may be subject to mitigation requirements to protect species viability.

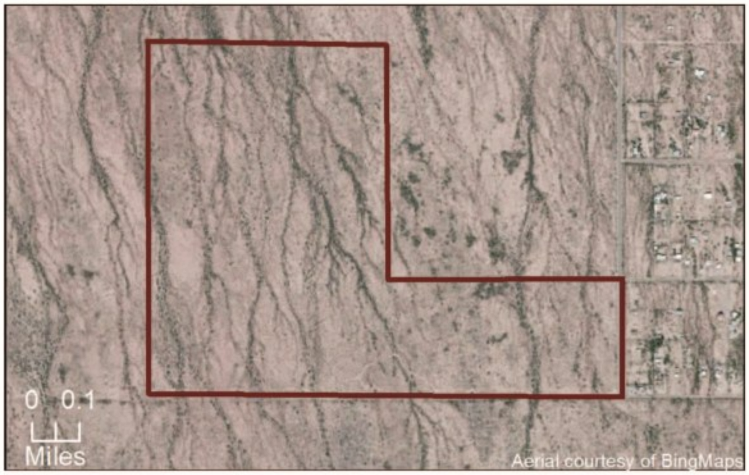
The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

These lands were originally surveyed under the NEPA process before construction of the Central Arizona Project (CAP). This includes areas identified by Reclamation as wildlife habitat areas ("green-up" areas) to be managed as mitigation for impacts from the CAP construction. Use of such areas would require consideration of mitigation for losses of wildlife habitat.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #61



0 100
Solar Score: 92

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 34 MW **Wind: None**

Name:
Valhalla

Facts:

Acres: 317

County: Pima

Jurisdiction: BLM

Previous Land Use: Undeveloped

Adjacent Land Use: Residential and undeveloped

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.15S., R.12E., sec. 20, S2NW, SW, S2SE.

Site Opportunities

* Majority of site has slope of <5%
* Site is close to transmission lines and roads
* Site is close to a load center
* Minimal environmental constraints

Site Constraints

* Active Management Area
* Special Status Species Habitat
* Potentially incompatible adjacent land uses

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		317
Slope <5%		273 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	33 miles
	115kV	0.1 miles
	230kV	12 miles
	500kV	28 miles
Active Management Area		Yes

Selected Environmental Factors

- Near urban area
- Special status species habitat
- Site is identified for disposal by BLM
- Site is managed as VRM Class III

Disclaimer: Nominated Sites Summary Sheets are intended to provide a preliminary indication of whether or not a particular site is suitable for solar or wind energy development. The information contained within this site summary has been created to give an overview of each site and is not a guarantee of a site's suitability for energy development. Developers should consult with appropriate government agencies and undertake further research before making a final determination on a site's suitability for their project(s).

SITE #61

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 34 MW solar energy facility would fit on the 273 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site suitable for PV or CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

This site is located on BLM-administered lands with a VRM class that may require special design features to minimize visual disturbances. Consultation with the BLM will determine whether the VRM class will impact development.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #62

Name:
Vincent Mullins

Facts:

Acres: 32

County: Pima

Jurisdiction: Private

Previous Land Use: Landfill

Adjacent Land Use: Industrial and residential

Surface Ownership: Private

Mineral Ownership: Private

Legal Description: T.14S., R.15E., sec. 5, NWSW

0 100
Solar Score: 73

Site is less than 100 acres and may not be suitable for CSP technology.

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 1.9 MW **Wind: None**

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	32
Slope <5%	15 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	25 miles
115kV	9 miles
230kV	15 miles
500kV	26 miles
Active Management Area	Yes

Selected Environmental Factors

- In urban area
- Special status species habitat
- Nearby residential developments
- Close proximity to road network

Site Opportunities

* Site is close to transmission lines and roads
* Site is within a load center
* Minimal environmental constraints

Site Constraints

* Only 47 percent of site exhibits slope of <5 percent
* Active Management Area
* Special Status Species Habitat
* Potentially incompatible adjacent land uses

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SITE #62

Remediation/Restoration Requirements

A search of federal and state records indicate the presence of leaking underground storage tanks directly to the east of the site. Drainage is expected to be to the west to the Pantano Wash, directly adjacent to the landfill. Groundwater plumes could have resulted in contamination of groundwater under the landfill.

Site Summary

A 1.9 MW solar energy facility would fit on the 15 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

There may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition. A more detailed site assessment can help identify the presence or likelihood of sensitive resources.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Surrounding areas may include some potentially incompatible land uses. For sites under local jurisdiction, developers should contact local planning departments to determine adjacent zoning designations.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #63

0 100
Solar Score: 82

Site is less than 100 acres and may not be suitable for CSP technology.

0 100
Community Wind Score: 0

0 100
Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 3.4 MW **Wind: None**

Site Opportunities

* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* BLM Special Recreation Management Area
* Special Status Species Habitat
* Sensitive soils
* Only 44 percent of site exhibits slope of <5 percent

Name:
White Sage Gravel Pits

Facts:

Acres: 61

County: Coconino

Previous Land Use: Gravel pits

Adjacent Land Use: Undeveloped BLM-administered land

Surface Ownership: BLM

Mineral Ownership: Federal

Legal Description: T.40N., R.2W., sec. 2, S2SWSW, NWSE

About This Site

Characteristic		Description
Solar Potential		Good
Wind Potential		None
Acres		61
Slope <5%		27 acres
Distance to Graded Road		<1 mile
Distance to Transmission Interconnection:		
	69kV	44 miles
	115kV	157 miles
	230kV	47 miles
	500kV	0.4 miles
Active Management Area		No

Selected Environmental Factors

- Near load center
- Special status species habitat
- Close proximity to 500kV line

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SITE #63

Remediation/Restoration Requirements

A search of federal and state records indicate no present or past contamination or presence of underground storage tanks at the site or within a quarter mile of its boundaries.

Site Summary

A 3.4 MW solar energy facility would fit on the 27 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

The site is located within a Special Recreation Management Area, which may place limitations on development. Developers should consult with the BLM to determine allowable uses in this area.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

Soil properties on this site may restrict renewable energy development. Some soil types require additional engineering requirements to support solar or wind energy infrastructure foundations. Further research through the property owner/administrator and USDA NRCS is recommended.

Restoration Design Energy Project

Environmental Impact Statement—Nominated Sites Summary

SITE #64

Name:
Wildcat Hill

Facts:

Acres: 75

County: Coconino

Jurisdiction: City of Flagstaff

Previous Land Use: Brownfield

Adjacent Land Use: Industrial, undeveloped

Surface Ownership: Private

Mineral Ownership: Private, State

Legal Description: T.21N., R.8E., sec. 9, NW.

0 100

Solar Score: 94.5

Site is less than 100 acres and may not be suitable for CSP technology.

0 100

Community Wind Score: 0

0 100

Utility Wind Score: 0

Estimated Maximum Potential Capacity[1]

Solar: 9 MW **Wind: None**

Site Opportunities

* Majority of site has slope of <5 percent
* Site is close to transmission lines and roads
* Site is close to a load center

Site Constraints

* Active Management Area
* Special Status Species habitat
* AZGFD big game habitat
* AZGFD Species and Habitat Conservation Guide Conservation Potential

About This Site

Characteristic	Description
Solar Potential	Good
Wind Potential	None
Acres	75
Slope <5%	72 acres
Distance to Graded Road	<1 mile
Distance to Transmission Interconnection:	
69kV	0.2 miles
115kV	66 miles
230kV	0 miles
500kV	32 miles
Active Management Area	No

Selected Environmental Factors

- Near urban area
- Special status species habitat
- Within AZGFD big game habitat
- AZGFD Conservation Potential area

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SITE #64

Remediation/Restoration Requirements

The site is a biosolids processing area for the Wildcat Hill Wastewater Treatment Facility. The site will receive a Phase I environmental site assessment from ADEQ. A search of federal and state records indicate no past contamination or presence of underground storage tanks (USTs) at the site. An existing UST, reported as "non-leaking" exists at the southeastern edge of the site. Other USTs and leaking USTs are across Rio de Flag, and therefore, there would be no hydrologic connection with any shallow groundwater present at the site.

Site Summary

A 9 MW solar energy facility would fit on the 72 acres of land with a slope of <5 percent. The size of developable acreage would likely make the site unsuitable for CSP technology.

This site's close proximity to roads can lower construction costs by providing easy access for equipment and workers. Nearby transmission lines may offer cost-efficient opportunities for interconnection.

The site's proximity to a load center may decrease transmission costs while increasing distribution options. Selling solar energy-generated electricity to a local market may increase community support for a project.

As a part of an Active Management Area, this site is within a region with heavy reliance on mined groundwater. Active Management Areas are subject to regulation pursuant to the Arizona Groundwater Code. Management goals for the Active Management Area may restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation.

The site contains habitat for federal or state-listed species, including threatened and endangered species. As a result, developers should consult with the appropriate state or federal land management agency and USFWS to determine which species' habitat may be present on the site and begin potential compliance process with the Endangered Species Act.

The site overlaps with an Arizona Game and Fish Department Species and Habitat Conservation Guide Conservation Potential area. These areas contain critical habitat and provide opportunities for people to enjoy and benefit from the presence of wildlife. Conservation potential areas are ranked on a scale of 1 to 6, with 1 indicating the lowest conservation potential, and 6 indicating the highest conservation potential. This site contains tier 4, 5, and/or 6 conservation potential.

DRAFT

Excerpt from
CULTURAL RESOURCE ASSESSMENT OF RENEWABLE ENERGY DEVELOPMENT AREAS IN ARIZONA

Prepared for:

EMPSi

For Submittal to:

Bureau of Land Management
Arizona State Office

Prepared by:

Christopher E. Rayle, MA, RPA
Steve Swanson, PhD, RPA

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4141 N. 32nd Street, Suite 102
Phoenix, Arizona 85018

BLM Permit No. AZ-000451

August 2011

APPENDIX D
CULTURAL HISTORY BACKGROUND OF ARIZONA

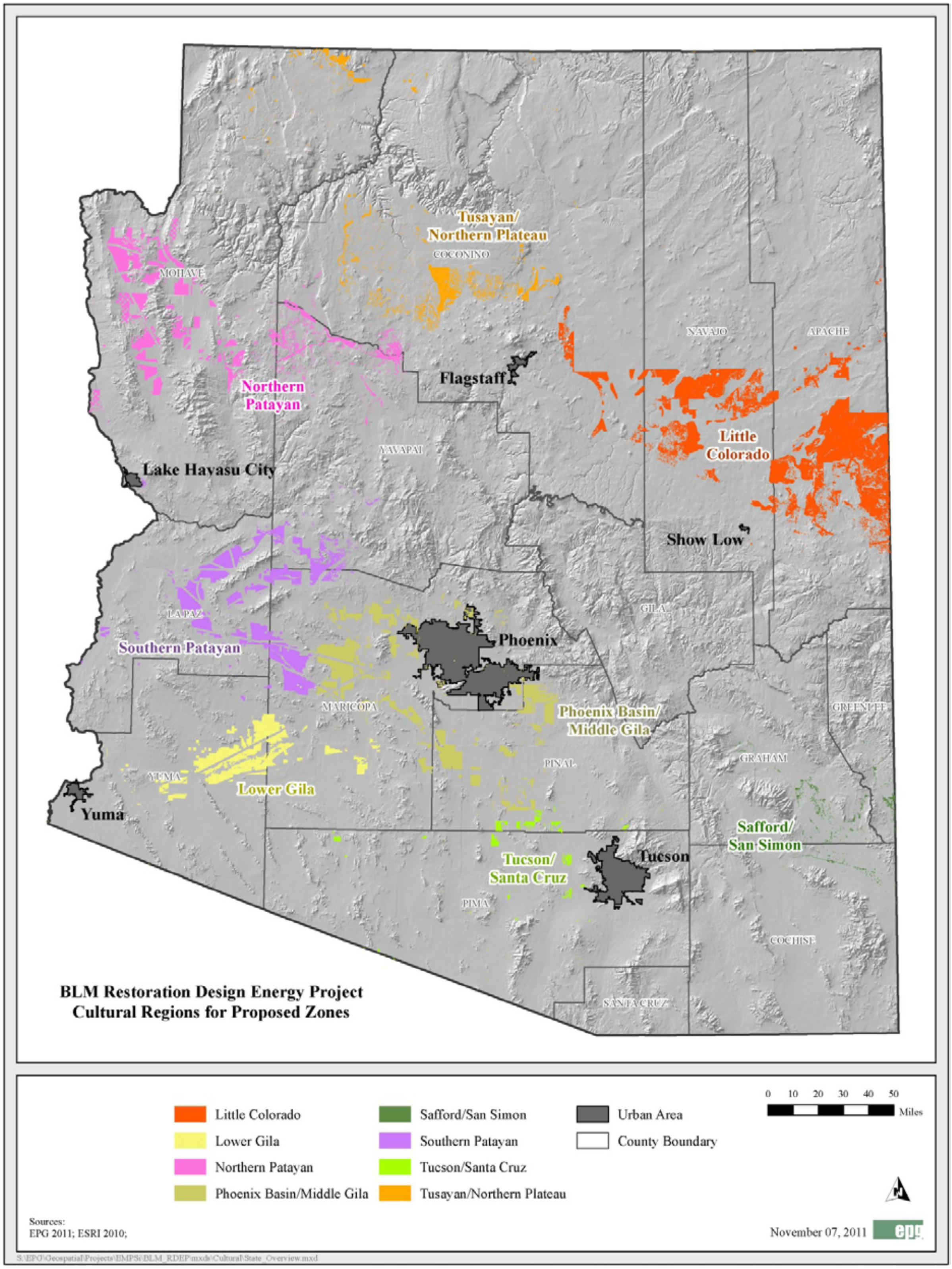
A culture history sets the background context and provides an understanding of the general characteristics of a culture group a specific time period. This section provides a general culture history for Arizona and detailed culture histories for the 8 cultural regions defined for the Bureau of Land Management (BLM) Restoration Design Energy Project (RDEP), as shown on Figure 1. The culture history of the State of Arizona spans approximately 12,000 years of human occupation, and is divided into several prehistoric and historic periods. Additional details of cultural resources in the planning area are provided in the *Cultural Resource Assessment Of Renewable Energy Development Areas In Arizona* (July 2011) prepared by Environmental Planning Group (BLM Permit No. AZ-000451) available by request from the BLM Arizona State Office.

Paleoindian Period (ca. 10,000 to 8000 BC)

The earliest occupation of present-day Arizona occurred during the Paleoindian period. At this time, prehistoric populations consisted of small, mobile groups of hunter-gatherers who hunted large game animals, collected native plants foods, and occupied temporary campsites (Cordell 1984). The most widely recognized Paleoindian cultural tradition, the Clovis complex, stems from excavations at Blackwater Draw, New Mexico, in 1932. These excavations yielded distinctive "fluted" projectile points as well as a number of stone and bone butchering and processing tools, in association with extinct Pleistocene megafauna dating to 11,500 to 11,000 years ago; since this time, a number of Paleoindian sites have been identified and excavated in southern Arizona (Boldurian and Cotter 1999; Bonnichsen and Turmire 1991).

Although Clovis represents the oldest recognized cultural tradition in the Southwest, a number of distinctive Paleoindian complexes, such as the Folsom and Cody, succeeded Clovis on the Great Plains where Paleoindian hunters shifted their focus to bison, following the extinction of mammoth (Frison 1993).

Figure 1. BLM RDEP Cultural Regions



Interestingly, Folsom assemblages are absent in southern Arizona. It has been suggested that this dichotomy resulted from resident Paleoindian populations foregoing bison hunting in favor of subsistence strategies suited to the changing climate, giving rise to the Archaic Cochise and San Dieguito traditions of the desert lowlands (Waters 1986).

Warming and cooling trends associated with continental and mountain glaciers characterize the Paleoindian period. Much of the Southwest consisted of verdant grasslands and playas that sustained numerous, now-extinct herbivore populations such as mammoth, tapir, camel, horse, and bison (Haynes 1970; Mehringer and Haynes 1965). Pollen data suggest an abrupt change in climate at the Pleistocene-Holocene transition, marked by declines in effective moisture and greater seasonal variability (Greiser 1980). This resulted in drastic alterations of vegetative patterns and the loss of browse vegetation. Extinction of large Pleistocene mammals, which was well underway during the Late Glacial period, was accelerated and species diversity became greatly reduced.

Although frequently characterized as nomadic hunters whose subsistence economy was focused on now-extinct megafauna and other large game, the Paleoindian occupants of the region probably pursued relatively diverse subsistence strategies that included intensive utilization of wild plant resources and hunting of large fauna. Very low population densities prevailed among these early regional inhabitants, who were organized as very small, residentially mobile, and socially fluid groups. Mobile demographic patterns of Paleoindian peoples contribute to the low visibility and relatively sparse occurrence of Paleoindian archaeological sites, as do factors such as soil accumulation that may obscure surface manifestations (Cordell 1979), or the absence of temporally diagnostic materials (e.g., Binford and Anderson 1992). Paleoindian site types may include, but are not limited to, kill sites, temporary hunting camps, base camps, processing sites, resource procurement sites, and quarries (Cordell 1984; Frison 1993; Haury 1953; Hemmings 1970; Hemmings and Haynes 1969).

Archaic Period (ca. 8000/7500 to 1200 BC)

The transition from the Paleoindian period to the Archaic period is marked by the absence of Pleistocene megafauna. It remains unclear to what extent climatic change and hunting contributed to their extinction. While extinction is not the only factor influencing the shift from large-scale hunting to small-scale hunting and plant processing, most scholars believe that this was at least one of the factors in the subsistence shift. The change from Paleoindian lanceolate and stemmed points to the Archaic side-notched types appears to have been abrupt and is easily detected in the archaeological record (Frison 1991).

Spring dominant storms, declines in plant cover, and water tables resulted in increased erosion and arroyo cutting (Albanese 1982). By 7000 BC the short-grass browsing areas appear to have reached their maximum, and lower effective moisture allowed for the invasion of the Southwest by a xerophytic

desert community dominated by juniper and mesquite. Faunal remains recovered from archaeological contexts indicate a general reduction in animal populations and the intrusion of desert-adapted species. By 2700 BC, the dry conditions that prevailed during the earlier phases appear to have abated. A southern shift in winter and summer frontal zones at approximately 1500 BC resulted in a general cooling trend in the region. This was followed by a warming trend, which produced climatic conditions similar to present day (Greiser 1980).

Archaic peoples increasingly incorporated a reliance on wild plants into their subsistence strategies as evidenced by stone tool assemblages, which became less specialized and distinctive than in the preceding period, and by increasing numbers of plant processing tools and features (Cordell 1984; Hayden 1982; Rogers 1966b).

Early Agricultural Period (ca. 1200 BC to AD 50)

The Early Agricultural period (previously called the Late Archaic) signifies the introduction of domesticated plant species, early farming practices, pottery production, and the beginnings of settled villages in the greater Southwest. The timing of the introduction of cultigens from Mexico is not known; however, radiocarbon dates on maize suggest that its cultivation in the Tucson Basin and other areas of the Southwest was underway by 1200 BC (Mabry 2008). Although this period marks significant changes in subsistence for many prehistoric peoples, the appearance of pottery and the transition to agriculture varied among cultural groups and geographic areas.

Ceramic Period (AD 50 to 1450)

The Ceramic period represents a time of significant socioeconomic/political changes for the prehistoric peoples of Arizona and the greater Southwest. Increasingly dependent on agricultural subsistence, many semi-sedentary peoples during this period became full-time, settled villagers. The regular use of pottery for containers and storage vessels, as well as the settlement of pithouse villages, highlights the transition from the Early Agricultural period to the agrarian lifeways that typified this era in the Southwest. As population densities increased in aggregated village settings, agricultural groups expanded into territories previously occupied by hunter-gatherers, which resulted in the reduction of the latter's population. Once committed to agrarian subsistence, elaborate technological innovation and approaches to increasing crop yields occurred (Cordell 1984; Plog 1997). Moreover, new ideas regarding property ownership, communal religious architecture, and symbols of differential social status also were developed (Plog 1997). Archaeologists have identified and defined numerous, distinct cultural traditions across Arizona, including the Patayan, Anasazi/Ancestral Pueblo, Sinagua, Hohokam, and Mogollon, as well as the Salado ceramic tradition.

Protohistoric (AD 1450 to 1691)

The Protohistoric period in the American Southwest was a time of transition between the prehistoric and historic periods, ranging from AD 1450 to 1700 (Gilpin and Phillips 1998; Ravesloot and Whittlesey 1987; Riley 1987; Wilcox and Masse 1981). This circumstance derives from the uncertainty in dating sites that postdate AD 1450, leaving a significant period of time accounted for between the end of the prehistoric and the Spanish entrada (Whittlesey, et al. 1994b). In North America, the most common definition of the Protohistoric is the period that postdates the arrival of Europeans to the New World, to the time of continuous occupation or contact with Europeans (Ravesloot and Whittlesey 1987). Arizona archaeologists broadly define the end of the Protohistoric with the entrance of Spanish Jesuit missionaries into southern Arizona at the beginning of the eighteenth century (Gilpin and Phillips 1998).

The period of AD 1300 to 1500 marked the beginning of a period of mass abandonment, migration, and social reorganization throughout the Southwest. As such, the Protohistoric Native American world in Arizona at the time of the Spanish entrada consisted of numerous tribal groups representing a mix of sedentary and nomadic cultural groups. Sedentary groups at this time included O'odham-speaking people along the Santa Cruz, San Pedro, and middle Gila rivers and desert regions of southern Arizona; Yuman-speaking tribes along the Colorado River (Mojave, Quechan, Cocopah, Maricopa, Hualapi, Havasupai, and Yavapai); and the Hopi and Zuni along the Little Colorado River. Extant nomadic groups included numerous Athabaskan speakers, including the semi-sedentary Navajo in northeast Arizona; and perhaps less sedentary Apachean groups in the central and southern mountains of eastern Arizona, including the Manso, Suma, Jano, and Jacome who ranged across a wide portion of northern Mexico and southeastern Arizona (Bolton 1949; Dozier 1983; Forbes 1959; Gilpin and Phillips 1998; Lockhart 1997; Seymour 2009; Wells 2006).

Spanish and Mexican Periods (AD 1691 to 1856)

Although the crown colony of Nuevo México first sent Franciscan missionaries to the Hopi pueblos starting in 1629, sustained contact with Europeans in the territory encompassing present-day Arizona did not begin until the end of the seventeenth century, when Jesuit priest Eusebio Francisco Kino began a mission building program in the region (Doelle 1984; Trimble 1989). Kino's mission building program provided the conduit for additional Spanish settlement in the region, and eventually led to the establishment of the Presidio San Agustín del Tucsón (present-day Tucson) in 1775 (Dobyns 1976). With the presidio for protection, Spanish colonists established farms along the Santa Cruz River and mines in the surrounding hills, and grazed cattle. Spanish goods and the relative safety provided by the presidio attracted indigenous settlers. The Spanish and Native American farmers grew corn, wheat, and vegetables, and cultivated fruit orchards; the San Agustín Mission was known for its impressive gardens (Williams 1986).

Following independence from Spain in 1821, economic instability and periodic civil war greatly affected the newly established Mexican government's ability to maintain control in the far northern reaches of the country. In the Pimería Alta, lack of leadership from the central government resulted in increasing indigenous hostilities and mass abandonments. In 1831, the San Agustín Mission was abandoned, followed by most of the residents of the Tucson Basin (Elson and Doelle 1987; Hard and Doelle 1978).

Following the annexation of Texas in 1846, the United States exerted pressure on Mexico to cede the New Mexico territory east of the Rio Grande. However, Mexico refused to recognize any of the United States' claims west of the Nueces River in Texas, and war quickly followed (Prince 1883). On August 18, 1846, American forces under the command of Brigadier General Stephen W. Kearny entered Santa Fé and secured the city without firing a shot (Lavender 1980; Simmons 1977). That October, approximately 340 soldiers of the Mormon Battalion led by Lieutenant Colonel Philip St. George Cooke departed from Santa Fé for San Diego in Alta California. Tasked with blazing a wagon trail to the Pacific, the battalion crossed into the Pimería Alta, where they seized the Presidio San Agustín de Tucsón from provisional Mexican forces who had retreated there prior to the army's arrival. The Cooke wagon road became the first American wagon route extending from New Mexico to the Pacific Coast. In the ensuing years, thousands of immigrants would travel this road during the California Gold Rush of 1848–1849, which subsequently became known as the Gila Trail (Pike 2004; Trimble 1989).

American Territorial and American Statehood Periods (AD 1856 to Present)

The Mexican-American War ended with the signing of the Treaty of Guadalupe Hidalgo in 1848. Under terms of the treaty, Mexico ceded most of its northern territories to the United States; this included disputed land in Texas, California, New Mexico, and all land north of the Gila River in present-day Arizona. Following the Gadsden Purchase of 1854, the United States acquired the rest of the land south of the Gila River to the present-day international boundary with Mexico (Trimble 1989). With annexation, the United States government quickly established a series of military forts, and began the first surveys of the region with the U.S. Army Corps of Topographical Engineers. Throughout the 1850s, survey parties mapped waterways and springs, noted soils and climate, and searched for potential wagon and railroad routes. Coinciding with the California gold rush, the U.S. Army constructed Fort Calhoun in 1849 and later Camp Yuma, on the California side of the lower Colorado River at Yuma Crossing, in order to provide protection for gold prospectors and settlers following the Gila Trail through Arizona (Lavender 1980; Trimble 1989).

After the end of the Civil War, immediate concerns in Arizona focused on Indian resettlement and economic expansion (Lavender 1980). Following the failure of the forced relocation to Bosque Redondo in New Mexico, in 1867 the

Navajo were eventually awarded 3.5 million acres in their former homeland in northeastern Arizona and northwestern New Mexico (ibid). Although the sedentary Pima and Papago of southern Arizona had provided supplies to immigrants bound for California during the gold rush, labored on Anglo ranches in the Santa Cruz Valley, and fought with U.S. troops against the Apache throughout the 1860s, Anglo settlers insisted on appropriating their lands. As such, the United States government instituted a system of reservation lands for the various tribal groups (Pritzker 2000). Subjugation and resettlement of the Apache, particularly the Chiricahua, proved more difficult for the government. Final peace with the Apache only came with the surrender of Geronimo and the last of his band (some two dozen followers) in 1886 (Sweeney 1992; Trimble 1989).

With native resettlement relatively complete, rural development and industrialization increased unimpeded throughout Arizona in the 1870s. Moreover, the introduction of the telegraph and railroad significantly improved conditions for Anglo settlement and growth. During this period cattle ranching, mining, and farming expanded throughout the territory (Trimble 1989). Beginning in the 1890s, the first of numerous reclamation projects to come were undertaken by the federal government; these involved the construction of dams, reservoirs, and canals throughout the region's river valleys. Although the guiding policy was the reclamation of arid lands in the West, the construction of dams decreased the threats posed by seasonal floods to irrigation agriculture, provided a stable delivery of water for the region's farms, and most importantly, generated hydroelectric power (Clark 1987; Trimble 1989). Presently, the region's reclamation projects provide agricultural, municipal, and industrial water to approximately one third of the population in the Southwest (Bureau of Reclamation 2000).

On February 14, 1912, the Arizona territory became the forty-eighth of the last contiguous states admitted to the Union. Its population continued to increase after statehood; however, the region remained rural in character and economically dependent on mining and agriculture. These conditions peaked following the United States' entry into the war in Europe in 1917, which produced a high demand for resources such as copper, cattle, and agricultural products. Although the war boosted the regional markets, the post-war years proved detrimental for the traditional economies, sparking repeated economic restructuring that continued throughout the twentieth century (Nash 1987; Trimble 1989).

Tourism provided the needed boost to the region throughout the 1920s. Dude ranches and resorts were very popular with the American public. Arizona constructed additional and improved highways, which resulted in the emergence of such cultural roadside icons as gas stations, auto lodges (motels), campgrounds, cafes, curio shops, and other recreational facilities (Nash 1987; Trimble 1989). Like the rest of the nation during the 1930s, Arizona was hit

hard by the Great Depression as agricultural prices fell, mines closed, and populations declined. In 1933, congress created the Civilian Conservation Corps (CCC), which put approximately three million young men to work on park, soil, and water conservation projects throughout the country (Cornebise 2004). Throughout the late 1930s, CCC workers built roads, bridges, trails, wells, reservoirs, and recreational facilities. By the end of the program in 1942, twenty-seven CCC camps had been established in Arizona.

Following the United States' entry into World War II, Arizona's natural resources were once again in demand for the war effort. Production in the raw materials industry increased; however, the biggest changes occurred in the expansion of manufacturing and service industries. With the expanding manufacturing sector, a significant portion of the rural population migrated to the major centers at Tucson and Phoenix, contributing to the loss of their small-town characters (Nash 1987; Sheridan 1995). This change in trajectory of the regional economy grew and strengthened in the post-war years, and produced the diverse and complex economy that exists today (Nash 1987).

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APPENDIX E
ARIZONA DEPARTMENT OF AGRICULTURE LIST OF PROHIBITED, REGULATED, AND RESTRICTED NOXIOUS WEEDS

The following is the list of prohibited, regulated and restricted noxious weeds for the state of Arizona. More information can be found on the Arizona Department of Agriculture, US Department of Agriculture National Invasive Species Information Center, and Center for Invasive Species and Ecosystem Health websites. The Federal noxious weed list can be found on the US Department of Agriculture Plants website.

Prohibited

The following noxious weeds (includes, plants, stolons, rhizomes, cuttings and seed) are prohibited from entry into the state.

Acroptilon repens (L.) DC.	Russian knapweed
Aegilops cylindrica Host.	Jointed goatgrass
Alhagi pseudalhagi (Bieb.) Desv.	Camelthorn
Alternanthera philoxeroides (Mart.) Griseb.	Alligator weed
Cardaria pubescens (C.A. Mey) Jarmolenko	Hairy whitetop
Cardaria chalepensis (L.) Hand-Muzz	Lens podded hoary cress
Cardaria draba (L.) Desv.	Globed- podded hoary cress (Whitetop)
Carduus acanthoides L.	Plumeless thistle
Cenchrus echinatus L.	Southern sandbur
Cenchrus incertus M.A. Curtis	Field sandbur
Centaurea calcitrapa L.	Purple starthistle
Centaurea iberica Trev. ex Spreng.	Iberian starthistle
Centaurea squarrosa Willd.	Squarrose knapweed
Centaurea sulphurea L.	Sicilian starthistle
Centaurea solstitialis L.	Yellow starthistle (St. Barnaby's thistle)

Centaurea diffusa L.	Diffuse knapweed
Centaurea maculosa L.	Spotted knapweed
Chondrilla juncea L.	Rush skeletonweed
Cirsium arvense L. Scop.	Canada thistle
Convolvulus arvensis L.	Field bindweed
Coronopus squamatus (Forskal) Ascherson	Creeping wartcress (Coronopus)
Cucumis melo L. var. *Dudaim Naudin*	Dudaim melon (Queen Anne's melon)
Cuscuta spp.	Dodder
Drymaria arenarioides H.B.K.	Alfombrilla (Lightningweed)
Eichhornia crassipes (Mart.) Solms	Floating water hyacinth
Eichhornia azurea (SW) Kunth.	Anchored water hyacinth
Elytrigia repens (L.) Nevski	Quackgrass
Euphorbia esula L.	Leafy spurge
Halogeton glomeratus (M. Bieb.) C.A. Mey	Halogeton
Helianthus ciliaris DC.	Texas blueweed
Hydrilla verticillata Royale	Hydrilla (Florida- elodea)
Ipomoea spp.	Morning glory. All species except Ipomoea carnea, Mexican bush morning glory; *Ipomoea triloba*, three-lobed morning glory (which is considered a restricted pest); and *Ipomoea aborescens*, morning glory tree
Ipomoea triloba L.	Three-lobed morning glory
Isatis tinctoria L.	Dyers woad
Linaria genistifolia var. *dalmatica*	Dalmation toadflax
Lythrum salicaria L.	Purple loosestrife
Medicago polymorpha L.	Burclover
Nassella trichotoma(Nees.) Hack.	Serrated tussock
Onopordum acanthium L.	Scotch thistle
Orobanche ramosa L.	Branched broomrape
Panicum repens L.	Torpedo grass
Peganum harmala L.	African rue (Syrian rue)
Pennisetum ciliare (L.) Link	buffelgrass
Portulaca oleracea L.	Common purslane
Rorippa austriaca (Crantz.) Bess.	Austrian fieldcres,
Salvinia molesta	Giant salvina
Senecio jacobaea L.	Tansy ragwort
Solanum carolinense L.	Carolina horsenettle
Sonchus arvensis L.	Perennial sowthistle
Solanum viarum Dunal	Tropical Soda Apple
Stipa brachychaeta Godr.	Puna grass
Striga spp.	Witchweed
Trapa natans L.	Water-chestnut
Tribulus terrestris L.	Puncturevine

Regulated

The following noxious weeds are regulated (includes plants, stolons, rhizomes, cuttings and seed) and if found within the state may be controlled or quarantined to prevent further infestation or contamination.

Cenchrus echinatus L.	Southern sandbur
Cenchrus incertus M.A. Curtis	Field sandbur
Convolvulus arvensis L.	Field bindweed
Eichhornia crassipes (Mart.) Solms	Floating water hyacinth
Medicago polymorpha L.	Burclover
Pennisetum ciliare (L.) Link	buffelgrass
Portulaca oleracea L.	Common purslane
Salvinia molesta	Giant Salvinia *
Tribulus terrestris L.	Puncturevine

* Added by Director's Administrative Order DAO 99-03 on 8/25/99

Restricted

The following noxious weeds are restricted (includes plants, stolons, rhizomes, cuttings and seed) and if found within the state shall be quarantined to prevent further infestation or contamination.

Acroptilon repens (L.) DC.	Russian knapweed
Aegilops cylindrica Host.	Jointed goatgrass
Alhagi pseudalhagi Bieb.) Desv.	Camelthorn
Cardaria draba (L.) Desv.	Globed-podded hoary cress (Whitetop)
Centaurea diffusa L.	Diffuse knapweed
Centaurea maculosa L.	Spotted knapweed
Centaurea solstitialis L.	Yellow starthistle (St. Barnaby's thistle)
Cuscuta spp.	Dodder
Eichhornia crassipes (Mart.) Solms	Floating water hyacinth
Elytrigia repens (L.) Nevski	Quackgrass
Euryops sunbcarnosus subsp. *vulgaris*	Sweet resinbush
Halogeton glomeratus (M. Bieb.) C.A. Mey	Halogeton
Helianthus ciliaris DC.	Texas blueweed
Ipomoea triloba L.	Three- lobed morning glory
Linaria genistifolia var. *dalmatica*	Dalmation toadflax
Onopordum acanthium L.	Scotch thistle

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APPENDIX F
SOUTHWEST REGIONAL GAP ANALYSIS PROJECT LANDCOVER TYPES AND DESCRIPTIONS FOR ARIZONA

The following are the Southwest Regional GAP Analysis Project landcover types and descriptions for Arizona. Descriptions were taken directly from Southwest Regional GAP Analysis Project – Land Cover Descriptions (USGS National GAP Analysis Program 2005).

Agriculture

An aggregated landcover type that includes both Pasture/Hay: areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle, where pasture/hay vegetation accounts for greater than 20 percent of total vegetation, and Cultivated Crops: areas used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards, where crop vegetation accounts for greater than 20 percent of total vegetation. Cultivated Crops also includes all land being actively tilled.

Apacherian-Chihuahuan Mesquite Upland Scrub

This ecological system occurs as upland shrublands that are concentrated in the extensive grassland-shrubland transition in foothills and piedmont in the Chihuahuan Desert. It extends into the Sky Island region to the west and the Edwards Plateau to the east. Substrates are typically derived from alluvium, often gravelly without a well-developed argillic or calcic soil horizon that would limit infiltration and storage of winter precipitation in deeper soil layers. *Prosopis* spp. and other deep-rooted shrubs exploit this deep soil moisture that is unavailable to grasses and cacti. Vegetation is typically dominated by *Prosopis glandulosa* or *Prosopis velutina* and succulents. Other desert scrub that may codominate or dominate includes *Acacia neovernicosa*, *Acacia constricta*, *Juniperus*

monosperma, or *Juniperus coahuilensis*. Grass cover is typically low. During the last century, the area occupied by this system has increased through conversion of desert grasslands as a result of drought, overgrazing by livestock, and/or decreases in fire frequency.

Apacherian-Chihuahuan Semi-Desert Grassland and Steppe

This ecological system is a broadly defined desert grassland, mixed shrub-succulent or xeromorphic tree savanna that is typical of the Borderlands of Arizona, New Mexico and northern Mexico [Apacherian region] but extends west to the Sonoran Desert, north into the Mogollon Rim and throughout much of the Chihuahuan Desert. It is found on gently sloping bajadas that supported frequent fire throughout the Sky Islands and on mesas and steeper piedmont and foothill slopes in the Chihuahuan Desert. It is characterized by typically diverse perennial grasses. Common grass species include *Bouteloua eriopoda*, *Bouteloua hirsuta*, *Bouteloua rothrockii*, *Bouteloua curtipendula*, *Bouteloua gracilis*, Eragrostis intermedia, *Muhlenbergia porteri*, *Muhlenbergia setifolia*, *Pleuraphis jamesii, Pleuraphis mutica*, and *Sporobolus airoides*, succulent species of Agave, Dasylirion, and Yucca, and tall-shrub/short-tree species of *Prosopis* and various oaks (e.g., *Quercus grisea, Quercus emoryi, Quercus arizonica*).

Barren Lands, Non-specific

Barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulation of earthen material. Generally, vegetation accounts for less than 15 percent of total cover.

Colorado Plateau Blackbrush-Mormon-tea Shrubland

This ecological system occurs in the Colorado Plateau on benchlands, colluvial slopes, pediments or bajadas. Elevation ranges from 560-1650 meters. Substrates are shallow, typically calcareous, non-saline and gravelly or sandy soils over sandstone or limestone bedrock, caliche or limestone alluvium. It also occurs in deeper soils on sandy plains where it may have invaded desert grasslands. The vegetation is characterized by extensive open shrublands dominated by *Coleogyne ramosissima* often with *Ephedra viridis*, *Ephedra torreyana*, or *Grayia spinosa*. Sandy portions may include *Artemisia filifolia* as codominant. The herbaceous layer is sparse and composed of graminoids such as *Achnatherum hymenoides, Pleuraphis jamesii*, or *Sporobolus cryptandrus*.

Colorado Plateau Mixed Bedrock Canyon and Tableland

The distribution of this ecological system is centered on the Colorado Plateau where it is comprised of barren and sparsely vegetated landscapes (generally less than 10 percent plant cover) of steep cliff faces, narrow canyons, and open tablelands of predominantly sedimentary rocks, such as sandstone, shale, and limestone. The vegetation is characterized by very open tree canopy or scattered trees and shrubs with a sparse herbaceous layer. Common species includes *Pinus edulis*, *Pinus ponderosa*, *Juniperus* spp., *Cercocarpus intricatus*, and

other short-shrub and herbaceous species, utilizing moisture from cracks and pockets where soil accumulates.

Colorado Plateau Mixed Low Sagebrush Shrubland

This ecological system occurs in the Colorado Plateau, Tavaputs Plateau and Uinta Basin in canyons, gravelly draws, hilltops, and dry flats at elevations generally below 1800 meters. Soils are often rocky, shallow, and alkaline. This type extends across northern New Mexico into the southern Great Plains on limestone hills. It includes open shrublands and steppe dominated by Artemisia nova or *Artemisia bigelovii* sometimes with *Artemisia tridentata* ssp. *wyomingensis* codominant. Semi-arid grasses such as *Achnatherum hymenoides*, *Aristida purpurea, Bouteloua gracilis, Hesperostipa comata, Pleuraphis jamesii*, or *Poa fendleriana* are often present and may form a graminoid layer with over 25 percent cover.

Colorado Plateau Pinyon-Juniper Shrubland

This ecological system is characteristic of the rocky mesatops and slopes on the Colorado Plateau and western slope of Colorado, but these stunted tree shrublands may extend further upslope along the low-elevation margins of taller pinyonjuniper woodlands. Sites are drier than Colorado Plateau Pinyon-Juniper Woodland. Substrates are shallow/rocky and shaley soils at lower elevations (1200-2000 meters). Sparse examples of the system grade into Colorado Plateau Mixed Bedrock Canyon and Tableland. The vegetation is dominated by dwarfed (usually less than 3 meters tall) *Pinus edulis* or *Juniperus osteosperma* trees forming extensive tall shrublands in the region along low-elevation margins of pinyon-juniper woodlands. Other shrubs, if present, may include Artemisia nova, *Artemisia tridentata* ssp. *wyomingensis*, *Chrysothamnus viscidiflorus*, or *Coleogyne ramosissima*. Herbaceous layers are sparse to moderately dense and typically composed of xeric graminoids.

Colorado Plateau Pinyon-Juniper Woodland

This ecological system occurs in dry mountains and foothills of the Colorado Plateau region including the Western Slope of Colorado to the Wasatch Range, south to the Mogollon Rim and east into the northwestern corner of New Mexico. It is typically found at lower elevations ranging from 1500-2440 meters. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay. *Pinus edulis* and/or *Juniperus osteosperma* dominate the tree canopy. In the southern portion of the Colorado Plateau in northern Arizona and northwestern New Mexico, *Juniperus monosperma* and hybrids of *Juniperus spp* may dominate or codominate the tree canopy. *Juniperus scopulorum* may codominate or replace *Juniperus osteosperma* at higher elevations. Understory layers are variable and may be dominated by shrubs, graminoids, or be absent. Associated species include *Arctostaphylos patula*, *Artemisia tridentata,*

Cercocarpus intricatus, Cercocarpus montanus, Coleogyne ramosissima, Purshia stansburiana, Purshia tridentata, Quercus gambelii, Bouteloua gracilis, Pleuraphis jamesii, or *Poa fendleriana.* This system occurs at higher elevations than Great Basin Pinyon-Juniper Woodland and Colorado Plateau shrubland systems where sympatric.

Developed, Medium - High Intensity

The developed medium intensity category includes areas with a mixture of constructed materials and vegetation. Impervious surface accounts for 50-79 percent of the total cover. These areas most commonly include single-family housing units. Developed, high intensity includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80 to 100 percent of the total cover.

Developed, Open Space - Low Intensity

Developed Open Space of low intensity includes areas with a mixture of some construction materials, but mostly vegetation in the form of lawn grasses. Impervious surfaces account for less than 20 percent of total cover. These areas most commonly include large lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. The developed, low intensity category includes areas with a mixture of constructed materials and vegetation. Impervious surfaces account for 20-49 percent of total cover. These areas most commonly include single family housing units.

Great Basin Pinyon-Juniper Woodland

This ecological system occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada. It is typically found at lower elevations ranging from 1600-2600 meters. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Woodlands dominated by a mix of *Pinus monophylla* and *Juniperus osteosperma*, pure or nearly pure occurrences of *Pinus monophylla,* or woodlands dominated solely by *Juniperus osteosperma* comprise this system. *Cercocarpus ledifolius* is a common associate. Understory layers are variable. Associated species include shrubs such as *Arctostaphylos patula, Artemisia arbuscula, Artemisia nova, Artemisia tridentata, Cercocarpus ledifolius, Cercocarpus intricatus, Coleogyne ramosissima, Quercus gambelii, Quercus turbinella*, and bunch grasses *Hesperostipa comata, Festuca idahoensis, Pseudoroegneria spicata, Leymus cinereus (= Elymus cinereus),* and *Poa fendleriana.* This system occurs at lower elevations than Colorado Plateau Pinyon-Juniper Woodland where sympatric.

Great Basin Semi-Desert Chaparral

This system includes chaparral on sideslopes transitioning from low-elevation desert landscapes up into pinyon-juniper woodlands of the western and central Great Basin. There are limited occurrences extending as far west as the inner Coast Ranges in central California. These are typically fairly open-canopy shrublands with open spaces either bare or supporting patchy grasses and forbs. Characteristic species may include *Arctostaphylos patula, Arctostaphylos pungens, Ceanothus greggii, Ceanothus velutinus, Cercocarpus montanus var. glaber, Cercocarpus intricatus, Eriogonum fasciculatum, Garrya flavescens, Quercus turbinella, Purshia stansburiana,* and *Rhus trilobata. Cercocarpus ledifolius* is generally absent. Typical fire regime in these systems varies with the amount of organic accumulation.

Inter-Mountain Basins Active and Stabilized Dune

This ecological system occurs in Intermountain West basins and is composed of unvegetated to moderately vegetated (less than 10-30 percent plant cover) active and stabilized dunes and sandsheets. Species occupying these environments are often adapted to shifting, coarse-textured substrates (usually quartz sand) and form patchy or open grasslands, shrublands or steppe composed of *Achnatherum hymenoides, Artemisia filifolia, Artemisia tridentata ssp. tridentata, Atriplex canescens, Ephedra spp., Coleogyne ramosissima, Ericameria nauseosa, Leymus flavescens, Prunus virginiana, Psoralidium lanceolatum, Purshia tridentata, Sporobolus airoides, Tetradymia tetrameres,* or *Tiquilia spp*.

Inter-Mountain Basins Big Sagebrush Shrubland

This ecological system occurs throughout much of the western U.S., typically in broad basins between mountain ranges, plains and foothills between 1500 and 2300 meters elevation. Soils are typically deep, well-drained and non-saline. These shrublands are dominated by *Artemisia tridentata ssp. tridentata* and/or *Artemisia tridentata ssp. wyomingensis. Scattered Juniperus spp., Sarcobatus vermiculatus, and Atriplex spp.* may be present in some stands. *Ericameria nauseosa, Chrysothamnus viscidiflorus, Purshia tridentata, or Symphoricarpos oreophilus* may codominate disturbed stands. Perennial herbaceous components typically contribute less than 25 percent vegetative cover. Common graminoid species include *Achnatherum hymenoides, Bouteloua gracilis, Elymus lanceolatus, Festuca idahoensis, Hesperostipa comata, Leymus cinereus, Pleuraphis jamesii, Pascopyrum smithii, Poa secunda, or Pseudoroegneria spicata*.

Inter-Mountain Basins Greasewood Flat

This ecological system occurs throughout much of the western U.S. in Intermountain basins and extends onto the western Great Plains. It typically occurs near drainages on stream terraces and flats or may form rings around more sparsely vegetated playas. Sites typically have saline soils, a shallow water table and flood intermittently, but remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations. This system usually occurs as a mosaic of multiple communities,

with open to moderately dense shrublands dominated or codominated by *Sarcobatus vermiculatus. Atriplex canescens, Atriplex confertifolia*, or *Krascheninnikovia lanata* may be present to codominant. Occurrences are often surrounded by mixed salt desert scrub. The herbaceous layer, if present, is usually dominated by graminoids. There may be inclusions of *Sporobolus airoides, Distichlis spicata* (where water remains ponded the longest), or *Eleocharis palustris* herbaceous types.

Inter-Mountain Basins Juniper Savanna

This widespread ecological system occupies dry foothills and sandsheets of western Colorado, northwestern New Mexico, northern Arizona, Utah, west into the Great Basin of Nevada and southern Idaho. It is typically found at lower elevations ranging from 1500-2300 meters. This system is generally found at lower elevations and more xeric sites than Great Basin Pinyon-Juniper Woodland or Colorado Plateau Pinyon-Juniper Woodland. These occurrences are found on lower mountain slopes, hills, plateaus, basins and flats often where juniper is expanding into semi-desert grasslands and steppe. The vegetation is typically open savanna, although there may be inclusions of more dense juniper woodlands. This savanna is typically dominated by *Juniperus osteosperma* trees with high cover of perennial bunch grasses and forbs, with *Bouteloua gracilis, Hesperostipa comata*, and *Pleuraphis jamesii* being most common. In the southern Colorado Plateau, *Juniperus monosperma* or juniper hybrids may dominate the tree layer. Pinyon trees are typically not present because sites are outside the ecological or geographic range of *Pinus edulis* and *Pinus monophylla*.

Inter-Mountain Basins Mat Saltbush Shrubland

This ecological system occurs on gentle slopes and rolling plains in the northern Colorado Plateau and Uinta Basin on Mancos Shale and arid, wind-swept basins and plains across parts of Wyoming. Substrates are shallow, typically saline, alkaline, fine-textured soils developed from shale or alluvium and may be associated with shale badlands. Infiltration rate is typically low. These landscapes that typically support dwarf-shrublands composed of relatively pure stands of *Atriplex* spp. such as *Atriplex corrugata* or *Atriplex gardneri*. Other dominant or codominant dwarf-shrubs may include *Artemisia longifolia, Artemisia pedatifida,* or *Picrothamnus desertorum*, sometimes with a mix of other low shrubs such as *Krascheninnikovia lanata* or *Tetradymia spinosa. Atriplex confertifolia* or *Atriplex canescens* may be present, but do not codominate. The herbaceous layer is typically sparse. Scattered perennial forbs occur, such as *Xylorhiza glabriuscula* and *Sphaeralcea grossulariifolia*, and the perennial grasses *Achnatherum hymenoides, Bouteloua gracilis, Elymus elymoides, Elymus lanceolatus* ssp. *lanceolatus, Pascopyrum smithii*, or *Sporobolus airoides* may dominate the herbaceous layer. In less saline areas, there may be inclusions grasslands dominated by *Hesperostipa comata, Leymus salinus, Pascopyrum smithii*, or *Pseudoroegneria spicata*. In Wyoming and possibly elsewhere, inclusions of non-saline, gravelly barrens or rock outcrops dominated by cushion plants such as *Arenaria hookeri* and *Phlox hoodii* without dwarf-shrubs may be present. Annuals are seasonally present and may include

Eriogonum inflatum, Plantago tweedyi, and the introduced annual grass *Bromus tectorum*.

Inter-Mountain Basins Mixed Salt Desert Scrub

This extensive ecological system includes open-canopied shrublands of typically saline basins, alluvial slopes and plains across the Intermountain western U.S. This type also extends in limited distribution into the southern Great Plains. Substrates are often saline and calcareous, medium- to fine-textured, alkaline soils, but include some coarser-textured soils. The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more *Atriplex* species such as *Atriplex confertifolia, Atriplex canescens, Atriplex polycarpa,* or *Atriplex spinifera*. Other shrubs present to codominate may include *Artemisia tridentata* ssp. *wyomingensis, Chrysothamnus viscidiflorus, Ericameria nauseosa, Ephedra nevadensis, Grayia spinosa, Krascheninnikovia lanata, Lycium* spp., *Picrothamnus desertorum*, or *Tetradymia* spp. *Sarcobatus vermiculatus* is generally absent, but if present does not codominate. The herbaceous layer varies from sparse to moderately dense and is dominated by perennial graminoids such as *Achnatherum hymenoides, Bouteloua gracilis, Elymus lanceolatus* ssp. *lanceolatus, Pascopyrum smithii, Pleuraphis jamesii, Pleuraphis rigida, Poa secunda,* or *Sporobolus airoides.* Various forbs are also present in this ecosystem.

Inter-Mountain Basins Semi-Desert Grassland

This widespread ecological system occurs throughout the intermountain western U.S. on dry plains and mesas, at approximately 1450 to 2320 meters (4750-7610 feet) elevation. These grasslands occur in lowland and upland areas and may occupy swales, playas, mesatops, plateau parks, alluvial flats, and plains, but sites are typically xeric. Substrates are often well-drained sandy or loamy-textured soils derived from sedimentary parent materials but are quite variable and may include fine-textured soils derived from igneous and metamorphic rocks. When they occur near foothill grasslands they will be at lower elevations. The dominant perennial bunch grasses and shrubs within this system are all very drought-resistant plants. These grasslands are typically dominated or codominated by *Achnatherum hymenoides, Aristida* spp., *Bouteloua gracilis, Hesperostipa comata, Muhlenbergia* sp., or *Pleuraphis jamesii* and may include scattered shrubs and dwarfshrubs of species of *Artemisia, Atriplex, Coleogyne, Ephedra, Gutierrezia*, or *Krascheninnikovia lanata*.

Inter-Mountain Basins Semi-Desert Shrub Steppe

This ecological system occurs throughout the intermountain western U.S., typically at lower elevations on alluvial fans and flats with moderate to deep soils. This semi-arid shrub-steppe is typically dominated by graminoids (less than 25 percent cover) with an open shrub layer. Characteristic grasses include *Achnatherum hymenoides, Bouteloua gracilis, Distichlis spicata, Hesperostipa comata, Pleuraphis jamesii, Poa secunda,* and *Sporobolus airoides.* The woody layer is often a mixture of shrubs and dwarf-shrubs. Characteristic species include *Atriplex canescens, Artemisia tridentata, Chrysothamnus greenei, Chrysothamnus viscidiflorus,*

Ephedra spp., *Ericameria nauseosa, Gutierrezia sarothrae*, and *Krascheninnikovia lanata. Artemisia tridentata* may be present but does not dominate. The general aspect of occurrences may be either open shrubland with patchy grasses or patchy open herbaceous layer. Disturbance may be important in maintaining the woody component. Microphytic crust is very important in some stands.

Inter-Mountain Basins Shale Badland

This widespread ecological system of the intermountain western U.S. is composed of barren and sparsely vegetated substrates (less than 10 percent plant cover) typically derived from marine shales but also includes substrates derived from siltstones and mudstones (clay). Landforms are typically rounded hills and plains that form a rolling topography. The harsh soil properties and high rate of erosion and deposition are driving environmental variables supporting sparse dwarf-shrubs, e.g., *Atriplex corrugata, Atriplex gardneri, Artemisia pedatifida*, and herbaceous vegetation.

Inter-Mountain Basins Volcanic Rock and Cinder Land

This ecological system occurs in the intermountain western U.S. and is limited to barren and sparsely vegetated volcanic substrates (generally less than 10 percent plant cover) such as basalt lava (malpais), basalt dikes with associated colluvium, basalt cliff faces and uplifted "backbones," tuff, cinder cones or cinder fields. It may occur as large-patch, small-patch and linear (dikes) spatial patterns. Vegetation is variable and includes a variety of species depending on local environmental conditions, e.g., elevation, age and type of substrate. At montane and foothill elevations scattered *Pinus ponderosa, Pinus flexilis*, or *Juniperus* spp. trees may be present. Shrubs such as *Ephedra* spp., *Atriplex canescens, Eriogonum corymbosum, Eriogonum ovalifolium*, and *Fallugia paradoxa* are often present on some lava flows and cinder fields. Species typical of sand dunes such as *Andropogon hallii* and *Artemisia filifolia* may be present on cinder substrates.

Inter-Mountain Basins Wash

This barren and sparsely vegetated (generally less than 10 percent plant cover) ecological system is restricted to intermittently flooded streambeds and banks that are often lined with shrubs such as *Sarcobatus vermiculatus, Ericameria nauseosa, Fallugia paradoxa*, and/or *Artemisia cana* ssp. *cana* (in more northern and mesic stands). *Grayia spinosa* may dominate in the Great Basin. Shrubs form a continuous or intermittent linear canopy in and along drainages but do not extend out into flats. Typically it includes patches of saltgrass meadow where water remains for the longest periods. Soils are generally less alkaline than those found in the playa system. Desert scrub species (e.g., *Acacia greggii, Prosopis* spp.), that are common in the Mojave, Sonoran and Chihuahuan desert washes, are not present. This type can occur in limited portions of the southwestern Great Plains.

Invasive Annual and Biennial Forbland

Areas that are dominated by introduced annual and/or biennial forb species such as: *Halogeton glomeratum*, *Kochia scoparia*, or *Salsola* spp.

Invasive Annual Grassland

Areas that are dominated by introduced annual grass species such as: *Avena* spp., *Bromus* spp., or *Schismus* spp.

Invasive Perennial Grassland

Areas that are dominated by introduced perennial grass species such as: *Agropyron cristatum, Bromus inermis, Eragrostis lehmannianna, Pennisetum* spp., *Poa bulbosa*, *P. pratensis*, or *Thinopyrum intermedium.*

Invasive Southwest Riparian Woodland and Shrubland

Areas that are dominated by introduced riparian woody species such as: *Tamarix* spp. and *Elaeagnus angustifolius.*

Madrean Encinal

Madrean Encinal occurs on foothills, canyons, bajadas and plateaus in the Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, extending north into Trans-Pecos Texas, southern New Mexico and sub-Mogollon Arizona. These woodlands are dominated by Madrean evergreen oaks along a low-slope transition below Madrean Pine-Oak Forest and Woodland and Madrean Pinyon-Juniper Woodland. Lower elevation stands are typically open woodlands or savannas where they transition into desert grasslands, chaparral or in some cases desertscrub. Common evergreen oak species include *Quercus arizonica, Quercus emoryi, Quercus intricata, Quercus grisea, Quercus oblongifolia, Quercus toumeyi*, and in Mexico *Quercus chihuahuensis* and *Quercus albocincta*. Madrean pine, Arizona cypress, pinyon and juniper trees may be present, but do not codominate. Chaparral species such as *Arctostaphylos pungens, Cercocarpus montanus, Purshia spp., Garrya wrightii, Quercus turbinella, Frangula betulifolia (= Rhamnus betulifolia*), or *Rhus* spp. may be present but do not dominate. The graminoid layer is usually prominent between trees in grassland or steppe that is dominated by warm-season grasses such as *Aristida* spp., *Bouteloua gracilis, Bouteloua curtipendula, Bouteloua rothrockii, Digitaria californica, Eragrostis intermedia, Hilaria belangeri, Leptochloa dubia, Muhlenbergia* spp., *Pleuraphis jamesii*, or *Schizachyrium cirratum*. This system includes seral stands dominated by shrubby Madrean oaks typically with a strong graminoid layer. In transition areas with drier chaparral systems, stands of chaparral are not dominated by Madrean oaks; however, Madrean Encinal may extend down along drainages.

Madrean Pine-Oak Forest and Woodland

This system occurs on mountains and plateaus in the Sierra Madre Occidentale and Sierra Madre Orientale in Mexico, Trans-Pecos Texas, southern New Mexico and Arizona, generally south of the Mogollon Rim. These forests and woodlands are composed of Madrean pines (*Pinus arizonica, Pinus engelmannii, Pinus leiophylla, or Pinus strobiformis*) and evergreen oaks (*Quercus arizonica,*

Quercus emoryi, or *Quercus grisea*) intermingled with patchy shrublands on most mid-elevation slopes (1500-2300 meters elevation). Other tree species include *Cupressus arizonica, Juniperus deppeana, Pinus cembroides, Pinus discolor, Pinus ponderosa* (with Madrean pines or oaks), and *Pseudotsuga menziesii*. Subcanopy and shrub layers may include typical encinal and chaparral species such as *Agave* spp., *Arbutus arizonica, Arctostaphylos pringlei, Arctostaphylos pungens, Garrya wrightii, Nolina* spp., *Quercus hypoleucoides, Quercus rugosa*, and *Quercus turbinella*. Some stands have moderate cover of perennial graminoids such as *Muhlenbergia emersleyi, Muhlenbergia longiligula, Muhlenbergia virescens*, and *Schizachyrium cirratum*. Fires are frequent with perhaps more crown fires than ponderosa pine woodlands, which tend to have more frequent ground fires on gentle slopes.

Mogollon Chaparral

This ecological system occurs across central Arizona (Mogollon Rim), western New Mexico and southern Utah and Nevada. It often dominants along the mid-elevation transition from the Mojave, Sonoran, and northern Chihuahuan deserts into mountains (1000-2200 meters). It occurs on foothills, mountain slopes and canyons in drier habitats below the encinal and *Pinus ponderosa* woodlands. Stands are often associated with more xeric and coarse-textured substrates such as limestone, basalt or alluvium, especially in transition areas with more mesic woodlands. The moderate to dense shrub canopy includes species such as *Quercus turbinella, Quercus toumeyi, Cercocarpus montanus, Canotia holacantha, Ceanothus greggii, Forestiera pubescens (= Forestiera neomexicana), Garrya wrightii, Juniperus deppeana, Purshia stansburiana, Rhus ovata, Rhus trilobata*, and *Arctostaphylos pungens* and *Arctostaphylos pringlei* at higher elevations. Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires.

Mojave Mid-Elevation Mixed Desert Scrub

This ecological system represents the extensive desert scrub in the transition zone above *Larrea tridentata – Ambrosia dumosa* desert scrub and below the lower montane woodlands (700-1800 meters elevations) that occurs in the eastern and central Mojave Desert. It is also common on lower piedmont slopes in the transition zone into the southern Great Basin. The vegetation in this ecological systems is quite variable. Codominants and diagnostic species include *Coleogyne ramosissima, Eriogonum fasciculatum, Ephedra nevadensis, Grayia spinosa, Menodora spinescens, Nolina* spp., *Opuntia acanthocarpa, Salazaria mexicana, Viguiera parishii, Yucca brevifolia*, or *Yucca schidigera*. Desert grasses, including *Achnatherum hymenoides, Achnatherum speciosum, Muhlenbergia porteri, Pleuraphis jamesii, Pleuraphis rigida*, or *Poa secunda*, may form an herbaceous layer. Scattered *Juniperus osteosperma* or desert scrub species may also be present.

North American Arid West Emergent Marsh

This widespread ecological system occurs throughout much of the arid and semi-arid regions of western North America, typically surrounded by savanna,

shrub steppe, steppe, or desert vegetation. Natural marshes may occur in depressions in the landscape (ponds, kettle ponds), as fringes around lakes, and along slow-flowing streams and rivers (such riparian marshes are also referred to as sloughs). Marshes are frequently or continually inundated, with water depths up to 2 meters. Water levels may be stable, or may fluctuate 1 m or more over the course of the growing season. Water chemistry may include some alkaline or semi-alkaline situations, but the alkalinity is highly variable even within the same complex of wetlands. Marshes have distinctive soils that are typically mineral, but can also accumulate organic material. Soils have characteristics that result from long periods of anaerobic conditions in the soils (e.g., gleyed soils, high organic content, redoximorphic features). The vegetation is characterized by herbaceous plants that are adapted to saturated soil conditions. Common emergent and floating vegetation includes species of Scirpus and/or Schoenoplectus, Typha, Juncus, Potamogeton, Polygonum, Nuphar, and Phalaris. This system may also include areas of relatively deep water with floating-leaved plants (Lemna, Potamogeton, and Brasenia) and submergent and floating plants (Myriophyllum, Ceratophyllum, and Elodea).

North American Warm Desert Badland

This ecological system is restricted to barren and sparsely vegetated (generally less than 10 percent plant cover) substrates typically derived from marine shale or mudstone (badlands and mudhills). The harsh soil properties and high rate of erosion and deposition are driving environmental variables supporting sparse shrubs and dwarf-shrubs e.g., *Atriplex hymenelytra*, and herbaceous vegetation.

North American Warm Desert Bedrock Cliff and Outcrop

This ecological system is found from subalpine to foothill elevations and includes barren and sparsely vegetated landscapes (generally less than 10 percent plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included are unstable scree and talus slopes that typically occur bellow cliff faces. Species present are diverse and may include *Bursera microphylla, Fouquieria splendens, Nolina bigelovii, Opuntia bigelovii*, and other desert species, especially succulents. Lichens are predominant lifeforms in some areas. May include a variety of desert shrublands less than 2 ha (5 acres) in size from adjacent areas.

North American Warm Desert Lower Montane Riparian Woodland and Shrubland

This ecological system occurs in mountain canyons and valleys of southern Arizona, New Mexico, and adjacent Mexico and consists of mid- to low-elevation (1100-1800 meters) riparian corridors along perennial and seasonally intermittent streams. The vegetation is a mix of riparian woodlands and shrublands. Dominant trees include *Populus angustifolia, Populus deltoides* ssp. *wislizeni, Populus fremontii, Platanus wrightii, Juglans major, Fraxinus velutina*, and *Sapindus saponaria*. Shrub dominants include S*alix exigua, Prunus* spp., *Alnus oblongifolia*, and *Baccharis salicifolia*. Vegetation is dependent upon annual or

periodic flooding and associated sediment scour and/or annual rise in the water table for growth and reproduction.

North American Warm Desert Pavement

This ecological system occurs throughout much of the warm deserts of North America and is composed of unvegetated to very sparsely vegetated (less than 2 percent plant cover) landscapes, typically flat basins where extreme temperature and wind develop ground surfaces of fine to medium gravel coated with "desert varnish." Very low cover of desert scrub species such as *Larrea tridentata* or *Eriogonum fasciculatum* is usually present. However, ephemeral herbaceous species may have high cover in response to seasonal precipitation, including *Chorizanthe rigida, Eriogonum inflatum,* and *Geraea canescens*.

North American Warm Desert Playa

This system is composed of barren and sparsely vegetated playas (generally less than 10 percent plant cover) found across the warm deserts of North America, extending into the extreme southern end of the San Joaquin Valley in California. Playas form with intermittent flooding, followed by evaporation, leaving behind a saline residue. Salt crusts are common throughout, with small saltgrass beds in depressions and sparse shrubs around the margins. Subsoils often include an impermeable layer of clay or caliche. Large desert playas tend to be defined by vegetation rings formed in response to salinity. Given their common location in wind-swept desert basins, dune fields often form downwind of large playas. In turn, playas associated with dunes often have a deeper water supply. Species may include *Allenrolfea occidentalis, Suaeda* spp.*, Distichlis spicata, Eleocharis palustris, Oryzopsis* spp., *Sporobolus* spp., *Tiquilia* spp., or *Atriplex* spp. Ephemeral herbaceous species may have high cover periodically.

North American Warm Desert Riparian Mesquite Bosque

This ecological system consists of low-elevation (less than 1100 meters) riparian corridors along intermittent streams in valleys of southern Arizona and New Mexico, and adjacent Mexico. Dominant trees include *Prosopis glandulosa* and *Prosopis velutina*. Shrub dominants include *Baccharis salicifolia, Pluchea sericea*, and *Salix exigua*. Vegetation, especially the mesquites, tap groundwater below the streambed when surface flows stop. Vegetation is dependent upon annual rise in the water table for growth and reproduction.

North American Warm Desert Riparian Woodland and Shrubland

This ecological system consists of low-elevation (less than 1200 meters) riparian corridors along medium to large perennial streams throughout canyons and the desert valleys of the southwestern United States and adjacent Mexico. The vegetation is a mix of riparian woodlands and shrublands. Dominant trees include *Acer negundo, Fraxinus velutina, Populus fremontii, Salix gooddingii, Salix lasiolepis, Celtis laevigata* var. *reticulata,* and *Juglans* major. Shrub dominants include *Salix geyeriana, Shepherdia argentea*, and *Salix exigua*. Vegetation is

dependent upon annual or periodic flooding and associated sediment scour and/or annual rise in the water table for growth and reproduction.

North American Warm Desert Volcanic Rockland

This ecological system occurs across the warm deserts of North America and is restricted to barren and sparsely vegetated (less than 10 percent plant cover) volcanic substrates such as basalt lava (malpais) and tuff. Vegetation is variable and includes a variety of species depending on local environmental conditions, e.g., elevation, age and type of substrate. Typically scattered *Larrea tridentata, Atriplex hymenelytra*, or other desert shrubs are present.

North American Warm Desert Wash

This ecological system is restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains and basin floors throughout the warm deserts of North America. Although often dry, the intermittent fluvial processes define this system, which are often associated with rapid sheet and gully flow. This system occurs as linear or braided strips within desert scrub- or desert grassland-dominated landscapes. The vegetation of desert washes is quite variable ranging from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. The woody layer is typically intermittent to open and may be dominated by shrubs and small trees such as *Acacia greggii, Brickellia laciniata, Baccharis sarothroides, Chilopsis linearis, Fallugia paradoxa, Hymenoclea salsola, Hymenoclea monogyra, Juglans microcarpa, Prosopis* spp., *Psorothamnus spinosus, Prunus fasciculata, Rhus microphylla, Salazaria mexicana*, or *Sarcobatus vermiculatus*.

Open Water

Areas of open water, generally with less than 25 percent cover of vegetation or soil.

Recently Burned

Areas that have burned in the recent past that are clearly evident in the imagery (images acquired between 1999-2001).

Recently Mined or Quarried

Areas where open pit mining or quarries are visible in the imagery (images acquired between 1999-2001), and are 2 hectares or greater in size.

Rocky Mountain Alpine-Montane Wet Meadow

These are high-elevation communities found throughout the Rocky Mountains and Intermountain regions, dominated by herbaceous species found on wetter sites with very low-velocity surface and subsurface flows. They range in elevation from montane to alpine (1000-3600 meters). These types occur as large meadows in montane or subalpine valleys, as narrow strips bordering ponds, lakes, and streams, and along toeslope seeps. They are typically found on flat areas or gentle slopes, but may also occur on sub-irrigated sites with slopes up to 10 percent. In alpine regions, sites typically are small depressions located

below late-melting snow patches or on snowbeds. Soils of this system may be mineral or organic. In either case, soils show typical hydric soil characteristics, including high organic content and/or low chroma and redoximorphic features. This system often occurs as a mosaic of several plant associations, often dominated by graminoids, including *Calamagrostis stricta, Caltha leptosepala, Cardamine cordifolia, Carex illota, Carex microptera, Carex nigricans, Carex scopulorum, Carex utriculata, Carex vernacula, Deschampsia caespitosa, Eleocharis quinqueflora, Juncus drummondii, Phippsia algida, Rorippa alpina, Senecio triangularis, Trifolium parryi*, and *Trollius laxus*. Often alpine dwarf-shrublands, especially those dominated by *Salix*, are immediately adjacent to the wet meadows. Wet meadows are tightly associated with snowmelt and typically not subjected to high disturbance events such as flooding.

Rocky Mountain Aspen Forest and Woodland

This widespread ecological system is more common in the southern and central Rocky Mountains, but occurs throughout much of the western U.S. and north into Canada, in the montane and subalpine zones. Elevations generally range from 1525 to 3050 meters (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand, and secondarily is limited by the length of the growing season or low temperatures. These are upland forests and woodlands dominated by *Populus tremuloides* without a significant conifer component (less than 25 percent relative tree cover). The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. Associated shrub species include *Symphoricarpos* spp., *Rubus parviflorus, Amelanchier alnifolia*, and *Arctostaphylos uva-ursi*. Occurrences of this system originate and are maintained by stand-replacing disturbances such as avalanches, crown fire, insect outbreak, disease and windthrow, or clearcutting by man or beaver, within the matrix of conifer forests.

Rocky Mountain Cliff and Canyon

This ecological system of barren and sparsely vegetated landscapes (generally less than10 percent plant cover) is found from foothill to subalpine elevations on steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. It is located throughout the Rocky Mountains and northeastern Cascade Ranges in North America. Also included are unstable scree and talus slopes that typically occur below cliff faces. There may be small patches of dense vegetation, but it typically includes scattered trees and/or shrubs. Characteristic trees includes species from the surrounding landscape, such as *Pseudotsuga menziesii, Pinus ponderosa, Pinus flexilis, Populus tremuloides, Abies concolor, Abies lasiocarpa,* or *Pinus edulis* and *Juniperus* spp. at lower elevations. There may be scattered shrubs present, such as species of *Holodiscus, Ribes, Physocarpus, Rosa, Juniperus*, and *Jamesia americana,*

Mahonia repens, Rhus trilobata, or *Amelanchier alnifolia*. Soil development is limited, as is herbaceous cover.

Rocky Mountain Gambel Oak-Mixed Montane Shrubland

This ecological system occurs in the mountains, plateaus and foothills in the southern Rocky Mountains and Colorado Plateau including the Uinta and Wasatch ranges and the Mogollon Rim. These shrublands are most commonly found along dry foothills, lower mountain slopes, and at the edge of the western Great Plains from approximately 2000 to 2900 meters in elevation, and are often situated above pinyon-juniper woodlands. Substrates are variable and include soil types ranging from calcareous, heavy, fine-grained loams to sandy loams, gravelly loams, clay loams, deep alluvial sand, or coarse gravel. The vegetation is typically dominated by *Quercus gambelii* alone or codominant with *Amelanchier alnifolia*, *Amelanchier utahensis, Artemisia tridentata, Cercocarpus montanus, Prunus virginiana, Purshia stansburiana, Purshia tridentata, Robinia neomexicana, Symphoricarpos oreophilus*, or *Symphoricarpos rotundifolius*. There may be inclusions of other mesic montane shrublands with *Quercus gambelii* absent or as a relatively minor component. This ecological system intergrades with the lower montane-foothills shrubland system and shares many of the same site characteristics. Density and cover of *Quercus gambelii* and *Amelanchier* spp. often increase after fire.

Rocky Mountain Lower Montane Riparian Woodland and Shrubland

This system is found throughout the Rocky Mountain and Colorado Plateau regions within a broad elevation range from approximately 900 to 2800 meters. This system often occurs as a mosaic of multiple communities that are tree-dominated with a diverse shrub component. This system is dependent on a natural hydrologic regime, especially annual to episodic flooding. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. They can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. It is also typically found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. Dominant trees may include *Acer negundo, Populus angustifolia, Populus balsamifera, Populus deltoides, Populus fremontii, Pseudotsuga menziesii, Picea pungens, Salix amygdaloides*, or *Juniperus scopulorum*. Dominant shrubs include *Acer glabrum, Alnus incana, Betula occidentalis, Cornus sericea, Crataegus rivularis, Forestiera pubescens, Prunus virginiana, Rhus trilobata, Salix monticola, Salix drummondiana, Salix exigua, Salix irrorata, Salix lucida, Shepherdia argentea*, or *Symphoricarpos* spp. Exotic trees of *Elaeagnus angustifolia* and *Tamarix* spp. are common in some stands. Generally, the upland vegetation surrounding this riparian system is different and ranges from grasslands to forests.

Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland

This is a highly variable ecological system of the montane zone of the Rocky Mountains. It occurs throughout the southern Rockies, north and west into

Utah, Nevada, Wyoming and Idaho. These are mixed-conifer forests occurring on all aspects at elevations ranging from 1200 to 3300 meters. Rainfall averages less than 75 cm per year (40-60 cm), with summer "monsoons" during the growing season contributing substantial moisture. The composition and structure of the overstory are dependent upon the temperature and moisture relationships of the site and the successional status of the occurrence. *Pseudotsuga menziesii* and *Abies concolor* are most frequent, but *Pinus ponderosa* may be present to codominant. *Pinus flexilis* is common in Nevada. *Pseudotsuga menziesii* forests occupy drier sites, and *Pinus ponderosa* is a common codominant. *Abies concolor*-dominated forests occupy cooler sites, such as upper slopes at higher elevations, canyon sideslopes, ridgetops, and north- and east-facing slopes which burn somewhat infrequently. *Picea pungens* is most often found in cool, moist locations, often occurring as smaller patches within a matrix of other associations. As many as seven conifers can be found growing in the same occurrence, and there are a number of cold-deciduous shrub and graminoid species common, including *Arctostaphylos uva-ursi, Mahonia repens, Paxistima myrsinites, Symphoricarpos oreophilus, Jamesia americana, Quercus gambelii*, and *Festuca arizonica*.

Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland

These are mixed-conifer forests of the Rocky Mountains west into the ranges of the Great Basin, occurring predominantly in cool ravines and on north-facing slopes. Elevations range from 1200 to 3300 m. Occurrences of this system are found on cooler and more mesic sites than Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland (CES306.823). Such sites include lower and middle slopes of ravines, along stream terraces, moist, concave topographic positions and north- and east-facing slopes which burn somewhat infrequently. *Pseudotsuga menziesii* and *Abies concolor* are most common canopy dominants, but *Picea engelmannii, Picea pungens*, or *Pinus ponderosa* may be present. This system includes mixed conifer/Populus tremuloides stands. A number of cold-deciduous shrub species can occur, including *Acer glabrum, Acer grandidentatum, Alnus incana, Betula occidentalis, Cornus sericea, Jamesia americana, Physocarpus malvaceus, Robinia neomexicana, Vaccinium membranaceum*, and *Vaccinium myrtillus*. Herbaceous species include *Bromus ciliatus, Carex geyeri, Carex rossii, Carex siccata, Muhlenbergia virescens, Pseudoroegneria spicata, Erigeron eximius, Fragaria virginiana, Luzula parviflora, Osmorhiza berteroi, Packera cardamine, Thalictrum occidentale*, and *Thalictrum fendleri*. Naturally occurring fires are of variable return intervals, and mostly light, erratic, and infrequent due to the cool, moist conditions.

Rocky Mountain Ponderosa Pine Woodland

This very widespread ecological system is most common throughout the cordillera of the Rocky Mountains, from the Greater Yellowstone region south. It is also found in the Colorado Plateau region, west into scattered locations in the Great Basin, and in the Black Hills of South Dakota and Wyoming. These woodlands occur at the lower treeline/ecotone between grassland or shrubland and more mesic coniferous forests typically in warm, dry, exposed sites.

Elevations range from less than 1900 meters in northern Wyoming to 2800 meters in the New Mexico mountains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops are most common. This ecological system generally occurs on igneous, metamorphic, and sedimentary material derived soils, with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acid pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. *Pinus ponderosa* (*primarily* var. *scopulorum* and var. *brachyptera*) is the predominant conifer; *Pseudotsuga menziesii, Pinus edulis*, and *Juniperus* spp. may be present in the tree canopy. The understory is usually shrubby, with *Artemisia nova, Artemisia tridentata, Arctostaphylos patula, Arctostaphylos uva-ursi*, *Cercocarpus montanus, Purshia stansburiana, Purshia tridentata, Quercus gambelii, Symphoricarpos oreophilus, Prunus virginiana, Amelanchier alnifolia*, and *Rosa* spp. common species. *Pseudoroegneria spicata* and species of *Hesperostipa, Achnatherum, Festuca, Muhlenbergia*, and *Bouteloua* are some of the common grasses. Mixed fire regimes and ground fires of variable return intervals maintain these woodlands, depending on climate, degree of soil development, and understory density.

Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland

Engelmann spruce and subalpine fir forests comprise a substantial part of the subalpine forests of the Cascades and Rocky Mountains from southern British Columbia east into Alberta, south into New Mexico and the Intermountain region. They are the matrix forests of the subalpine zone, with elevations ranging from 1275 meters in its northern distribution to 3355 meters in the south (4100-11,000 feet). They often represent the highest elevation forests in an area. Sites within this system are cold year-round, and precipitation is predominantly in the form of snow, which may persist until late summer. Snowpacks are deep and late-lying, and summers are cool. Frost is possible almost all summer and may be common in restricted topographic basins and benches. Despite their wide distribution, the tree canopy characteristics are remarkably similar, with *Picea engelmannii* and *Abies lasiocarpa* dominating either mixed or alone. *Pseudotsuga menziesii* may persist in occurrences of this system for long periods without regeneration. *Pinus contorta* is common in many occurrences, and patches of pure *Pinus contorta* are not uncommon, as well as mixed conifer/*Populus tremuloides* stands. In some areas, such as Wyoming, *Picea engelmannii*-dominated forests are on limestone or dolomite, while nearby codominated spruce-fir forests are on granitic or volcanic rocks. Xeric species may include *Juniperus communis, Linnaea borealis, Mahonia repens*, or *Vaccinium scoparium*. More northern occurrences often have taller, more mesic shrub and herbaceous species, such as *Empetrum nigrum, Rhododendron albiflorum*, and *Vaccinium membranaceum*. Disturbance includes occasional blow-down, insect outbreaks and stand-replacing fire.

Rocky Mountain Subalpine Mesic Meadow

This Rocky Mountain ecological system is restricted to sites in the subalpine zone where finely textured soils, snow deposition, or wind-swept dry conditions

limit tree establishment. It is found typically above 3000 m in elevation in the southern part of its range and above 1500 meters in the northern part. These upland communities occur on gentle to moderate gradient slopes. The soils are typically seasonally moist to saturated in the spring, but if so will dry out later in the growing season. Vegetation is typically forb-rich, with forbs contributing more to overall herbaceous cover than graminoids. Important taxa include *Erigeron* spp., *Asteraceae* spp., *Mertensia* spp., *Penstemon* spp., *Campanula* spp., *Lupinus* spp., *Solidago* spp., *Ligusticum* spp., *Thalictrum occidentale, Valeriana sitchensis, Balsamorhiza sagittata, Wyethia* spp., *Deschampsia caespitosa, Koeleria macrantha*, and *Dasiphora fruticosa*. Burrowing mammals can increase the forb diversity.

Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland

This is a high-elevation system of the Rocky Mountains, dominated by *Picea engelmannii* and *Abies lasiocarpa*. It extends eastward into the northeastern Olympic Mountains and the northeastern side of Mount Rainier in Washington. Occurrences are typically found in locations with cold-air drainage or ponding, or where snowpacks linger late into the summer, such as north-facing slopes and high-elevation ravines. They can extend down in elevation below the subalpine zone in places where cold-air ponding occurs; northerly and easterly aspects predominate. These forests are found on gentle to very steep mountain slopes, high-elevation ridgetops and upper slopes, plateau-like surfaces, basins, alluvial terraces, well-drained benches, and inactive stream terraces. In the Olympics and northern Cascades, the climate is more maritime than typical for this system, but due to the lower snowfall in these rainshadow areas, summer drought may be more significant than snowpack in limiting tree regeneration in burned areas. *Picea engelmannii* is rare in these areas. Mesic understory shrubs include *Menziesia ferruginea, Vaccinium membranaceum, Rhododendron albiflorum, Amelanchier alnifolia, Rubus parviflorus, Ledum glandulosum, Phyllodoce empetriformis*, and *Salix* spp. Herbaceous species include *Actaea rubra, Maianthemum stellatum, Cornus canadensis, Erigeron eximius, Gymnocarpium dryopteris, Rubus pedatus, Saxifraga bronchialis, Tiarella* spp., *Lupinus arcticus* ssp. *subalpinus, Valeriana sitchensis*, and graminoids *Luzula glabrata* var. *hitchcockii* or *Calamagrostis canadensis*. Disturbances include occasional blow-down, insect outbreaks and stand-replacing fire.

Rocky Mountain Subalpine-Montane Riparian Shrubland

This system is found throughout the Rocky Mountain cordillera from New Mexico north into Montana, and also occurs in mountainous areas of the Intermountain region and Colorado Plateau. These are montane to subalpine riparian shrublands occurring as narrow bands of shrubs lining streambanks and alluvial terraces in narrow to wide, low-gradient valley bottoms and floodplains with sinuous stream channels. Generally it is found at higher elevations, but can be found anywhere from 1700-3475 m. Occurrences can also be found around seeps, fens, and isolated springs on hillslopes away from valley bottoms. Many of the plant associations found within this system are associated with beaver

activity. This system often occurs as a mosaic of multiple communities that are shrub- and herb-dominated and includes above-treeline, willow-dominated, snowmelt-fed basins that feed into streams. The dominant shrubs reflect the large elevational gradient and include *Alnus incana, Betula nana, Betula occidentalis, Cornus sericea, Salix bebbiana, Salix boothii, Salix brachycarpa, Salix drummondiana, Salix eriocephala, Salix geyeriana, Salix monticola, Salix planifolia*, and *Salix wolfii*. Generally the upland vegetation surrounding these riparian systems are of either conifer or aspen forests.

Sonora-Mojave Creosotebush-White Bursage Desert Scrub

This ecological system forms the vegetation matrix in broad valleys, lower bajadas, plains and low hills in the Mojave and lower Sonoran deserts. This desert scrub is characterized by a sparse to moderately dense layer (2-50 percent cover) of xeromorphic microphyllous and broad-leaved shrubs. *Larrea tridentata* and Ambrosia dumosa are typically dominants, but many different shrubs, dwarf-shrubs, and cacti may codominate or form typically sparse understories. Associated species may include *Atriplex canescens, Atriplex hymenelytra, Encelia farinosa, Ephedra nevadensis, Fouquieria splendens, Lycium andersonii*, and *Opuntia basilaris*. The herbaceous layer is typically sparse, but may be seasonally abundant with ephemerals. Herbaceous species such as *Chamaesyce* spp., *Eriogonum inflatum, Dasyochloa pulchella, Aristida* spp., *Cryptantha* spp., *Nama* spp., and *Phacelia* spp. are common.

Sonora-Mojave Mixed Salt Desert Scrub

This system includes extensive open-canopied shrublands of typically saline basins in the Mojave and Sonoran deserts. Stands often occur around playas. Substrates are generally fine-textured, saline soils. Vegetation is typically composed of one or more *Atriplex* species such as *Atriplex canescens* or *Atriplex polycarpa* along with other species of *Atriplex*. Species of *Allenrolfea, Salicornia, Suaeda*, or other halophytic plants are often present to codominant. Graminoid species may include *Sporobolus airoides* or *Distichlis spicata* at varying densities.

Sonoran Mid-Elevation Desert Scrub

This transitional desert scrub system occurs along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region between 750 and 1300 meters. Stands occur in the Bradshaw, Hualapai, and Superstition mountains, among other desert ranges. Sites range from a narrow strip on steep slopes to very broad areas such as the Verde Valley. Climate is too dry for chaparral species to be abundant, and freezing temperatures during winter are too frequent and prolonged for many of the frost-sensitive species, such as *Carnegia gigantea, Parkinsonia microphylla, Prosopis* spp., *Olneya tesota, Ferocactus* sp., and *Opuntia bigelovii*. Substrates are generally rocky soils derived from parent materials such as limestone, granitic rocks or rhyolite. The vegetation is typically composed of an open shrub layer of *Larrea tridentata, Ericameria linearifolia*, or *Eriogonum fasciculatum* with taller

shrub such as *Canotia holacantha* (limestone or granite) or *Simmondsia chinensis* (rhyolite). The herbaceous layer is generally sparse.

Southern Colorado Plateau Sand Shrubland

This large-patch ecological system is found on the south-central Colorado Plateau in northeastern Arizona extending into southern and central Utah. It occurs on windswept mesas, broad basins and plains at low to moderate elevations (1300-1800 meters). Substrates are stabilized sandsheets or shallow to moderately deep sandy soils that may form small hummocks or small coppice dunes. This semi-arid, open shrubland is typically dominated by short shrubs (10-30 percent cover) with a sparse graminoid layer. The woody layer is often a mixture of shrubs and dwarf-shrubs. Characteristic species include *Ephedra cutleri, Ephedra torreyana, Ephedra viridis,* and *Artemisia filifolia. Coleogyne ramosissima* is typically not present. *Poliomintha incana, Parryella filifolia, Quercus havardii* var. *tuckeri*, or *Ericameria nauseosa* may be present to dominant locally. *Ephedra cutleri* and *Ephedra viridis* often assume a distinctive matty growth form. Characteristic grasses include *Achnatherum hymenoides, Bouteloua gracilis, Hesperostipa comata*, and *Pleuraphis jamesii*. The general aspect of occurrences is an open low shrubland but may include small blowouts and dunes. Occasionally grasses may be moderately abundant locally and form a distinct layer. Disturbance may be important in maintaining the woody component. Eolian processes are evident, such as pediceled plants, occasional blowouts or small dunes, but the generally higher vegetative cover and less prominent geomorphic features distinguish this system from Inter-Mountain Basins Active and Stabilized Dune.

Southern Rocky Mountain Montane-Subalpine Grassland

This Rocky Mountain ecological system typically occurs between 2200 and 3000 meters on flat to rolling plains and parks or on lower sideslopes that are dry, but it may extend up to 3350 meters on warm aspects. Soils resemble prairie soils in that the Ahorizon is dark brown, relatively high in organic matter, slightly acid, and usually well-drained. An occurrence usually consists of a mosaic of two or three plant associations with one of the following dominant bunch grasses: *Danthonia intermedia, Danthonia parryi, Festuca idahoensis, Festuca arizonica, Festuca thurberi, Muhlenbergia filiculmis*, or *Pseudoroegneria spicata*. The subdominants include *Muhlenbergia montana, Bouteloua gracilis*, and *Poa secunda*. These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole, ponderosa pine, and aspen forests. In limited circumstances (e.g., South Park in Colorado), they form the "matrix" of high-elevation plateaus.



Appendix G

Response to Comments on the RDEP Draft EIS

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APPENDIX G
RESPONSE TO COMMENTS ON THE RDEP DRAFT ENVIRONMENTAL IMPACT STATEMENT

G.1 INTRODUCTION

After publishing the RDEP Draft EIS, the BLM had a 90-day public comment period to receive comments on it. The BLM received written comments by mail, email, and submitted at the public meetings, as well as oral comments transcribed at public meetings. Comments covered a wide spectrum of thoughts, opinions, ideas, and concerns. BLM recognizes that commenters invested considerable time and effort to submit comments on the Draft EIS, and developed a comment analysis methodology to ensure that all comments were considered as directed by NEPA regulations.

The BLM has identified and formally responded to all substantive public comments. A systematic process for responding to comments was developed to ensure all substantive comments were tracked and considered. Upon receipt, each comment letter was assigned an identification number and logged into an excel-based database that allowed the BLM to organize, categorize, and respond to comments. Substantive comments from each letter were coded to appropriate categories based on content of the comment, retaining the link to the commenter. The categories generally follow the sections presented in the Draft EIS, though some relate to the planning process or editorial concerns.

Comments similar to each other were grouped under a topic heading; BLM drafted a statement summarizing the issue(s) contained in the comments. The responses were crafted to respond to the comments and if a change to the EIS was warranted.

Although each comment letter was diligently considered, the comment analysis process involved determining whether a comment was substantive or non-substantive in nature. In performing this analysis, BLM relied on the CEQ's regulations to determine what constituted a substantive comment.

A substantive comment does one or more of the following:

- Questions, with a reasonable basis, the accuracy of the information and/or analysis in the EIS;
- Questions, with a reasonable basis, the adequacy of the information and/or analysis in the EIS;
- Presents reasonable alternatives other than those presented in the Draft EIS that meet the purpose and need of the proposed action and addresses significant issues;
- Questions, with a reasonable basis, the merits of an alternative or alternatives;
- Causes changes in or revisions to the proposed action; and
- Questions, with a reasonable basis, the adequacy of the planning process itself.

Additionally, BLM's NEPA handbook identifies the following types of substantive comments:

- <u>Comments on the Adequacy of the Analysis</u>: Comments that express a professional disagreement with the conclusions of the analysis or assert that the analysis is inadequate are substantive in nature but may or may not lead to changes in the Proposed RMP/Final EIS. Interpretations of analyses should be based on professional expertise. Where there is disagreement within a professional discipline, a careful review of the various interpretations is warranted. In some cases, public comments may necessitate a reevaluation of analytical conclusions. If, after reevaluation, the manager responsible for preparing the EIS (authorized officer [AO]) does not think that a change is warranted, the response should provide the rationale for that conclusion.
- <u>Comments That Identify New Impacts, Alternatives, or Mitigation Measures</u>: Public comments on a draft EIS that identify impacts, alternatives, or mitigation measures that were not addressed in the draft are substantive. This type of comment requires the AO to determine whether it warrants further consideration. If it does, the AO must determine whether the new impacts, new alternatives, or new mitigation measures should be analyzed in the Final EIS, a supplement to the Draft EIS, or a completely revised and recirculated Draft EIS.
- <u>Disagreements with Significance Determinations</u>: Comments that directly or indirectly question, with a reasonable basis, determinations regarding the significance or severity of impacts are substantive. A reevaluation of these determinations may be

warranted and may lead to changes in the Final EIS. If, after reevaluation, the AO does not think that a change is warranted, the response should provide the rationale for that conclusion.

Comments that failed to meet the above description were considered non-substantive. Many comments received throughout the process expressed personal opinions or preferences, had little relevance to the adequacy or accuracy of the Draft EIS, or represented commentary regarding resource management and/or impacts without any real connection to the document being reviewed. These comments did not provide specific information to assist the planning team in making changes to the alternatives or impact analysis in the Draft EIS, and are not addressed further in this document. Examples of some of these types of comments include the following:

- The best of the alternatives is Alternative D (or A, B, or C);
- BLM has yet to show land stewardship at or above the level currently demonstrated by the private sector;
- RDEP does not reflect balanced land management;
- More land should be protected as wilderness;
- I want the EIS to reflect the following for this area: no grazing, no logging, no drilling, no mining, and no OHVs;
- More areas should be made available for multiple uses (drilling, OHVs, ROWs, etc.) without severe restrictions.

Opinions, feelings, and preferences for one element or one alternative over another, and comments of a personal and/or philosophical nature were all read, analyzed, and considered, but because such comments are not substantive in nature, BLM did not include them in the report nor respond to them. It is also important to note that while all comments were reviewed and considered, comments were not counted as "votes." The NEPA public comment period is neither considered an election nor does it result in a representative sampling of the population. Therefore, public comments are not appropriate to be used as a democratic decision-making tool or as a scientific sampling mechanism.

Comments citing editorial changes to the document were reviewed and incorporated. The Final EIS has been extensively technically edited and revised to fix typos, missing references, definitions, and acronyms, and other clarifications as needed.

Copies of all comment documents received on the Draft EIS, as well as transcripts of comments delivered orally during the public meetings, are available by request on CD from the BLM's Arizona State Office and on-line via the RDEP project Web site. The submission numbers for the comment documents are printed on the right margin of the first page of the comment

document for comments received by mail, email, at meetings, or delivered orally during the public meetings.

G.1.1 Campaign letters

The Wilderness Society held a standardized letter campaign for the RDEP effort through which their constituents were able to submit the standard letter or a modified version of the letter indicating support for The Wilderness Society's position on RDEP. Individuals who submitted the modified standard letter generally added new comments or information to the letter or edited it to reflect their main issue. Modified letters with unique comments were given their own letter number and coded appropriately. All commenters who used The Wilderness Society's campaign letter are listed in the **Campaign Letter Commenter List** following the comment responses.

G.1.2 How the Appendix is Organized

The appendix is divided up into three main sections. The first section, **Introduction**, provides an overview of the comment response process. The second section, **Issue Topics, Responses, and Comments**, is organized by the primary topic and then by specific issue subtopics that relate to an aspect of NEPA, the BLM planning process, or specific resources and resource uses. For example, all comments that relate to aspects of the Alternatives fall under the heading "1.2.2 Alternatives". This includes subsections such as Design Features and Best Management Practices, the Elimination Criteria, and any of the six alternatives. Comments and responses for baseline information (such as the information found in Chapter 3, Affected Environment) and impact analysis are found under the respective resource topic. For example, you can find the comments related to the affected environment and impact analysis on cultural resources under the "1.2.3 Cultural Resources" heading. Each topic or subtopic contains a summary statement, the BLM's response to the summary statement, and excerpts from individual comment letters. Excepts are reprinted directly from the submitted comment and have not been edited for spelling, grammar, or punctuation.

The third section, **Commenter Lists**, provides the names of individuals who submitted comment letters (whether unique or a version of The Wilderness Society's campaign letter) on the Draft EIS. Comment submissions are indexed and listed alphabetically by the commenter's last name.

G.2 Issue Topics, Responses, and Comments

G.2.1 Air Resources

Impact Analysis

Summary:

The commenter suggests that the RDEP could temporarily increase ambient particulate matter (dust) levels.

Response:

The RDEP identifies lands across Arizona that are most suitable for the development of renewable energy. The proposed land use allocations are at the planning-level scale and would not authorize any specific projects or imply such approval. Any proposal for a wind or solar energy project will still require site specific permitting, additional environmental analysis, and NEPA compliance. The environmental consequences presented in this EIS document the types and general magnitude of impacts that could be anticipated from typical solar and wind energy developments.

Short-term increases in particulate matter during construction are discussed in the Draft EIS in Section 4.2.1, Air Quality and Air-Quality-related Values, Impacts Common to All Alternatives. The BLM recognizes that fugitive dust from construction could exceed the NAAQS for particulate matter at project site boundaries (Draft EIS pg. 4-11). As discussed in the Draft EIS, fugitive dust impacts from site-specific renewable energy development on BLM-administered lands would be addressed through the right-of-way application process by requiring a Dust Abatement Plan and implementing design measures and best management practices, such as those in Appendix B of the EIS. In addition, site-specific NEPA analysis for actions on BLM-administered lands would assess the specific level of effect of that action. Site-specific actions would also be subject to local air quality permitting requirements, including reviewing potential impacts and proposed dust control measures.

Comments:

Submission No: RDEP-Drft-0059

Commenter: Diane L. Arnst, Arizona Department of Environmental Quality, Air Quality Division

Comment: REDUCE DISTURBANCE of PARTICULATE MATTER during CONSTRUCTION

This action, plan or activity may temporarily increase ambient particulate matter (dust) levels. Particulate matter 10 microns in size and smaller can penetrate the lungs of human beings and animals and is subject to a National Ambient Air Quality Standard (NAAQS) to protect public health and welfare. Particulate matter 2.5 microns in size and smaller is difficult for lungs to expel and has been linked to increases in death rates; heart attacks by disturbing heart rhythms and increasing plaque and clotting; respiratory infections; asthma attacks and cardiopulmonary obstructive disease (COPD) aggravation. It is also subject to a NAAQS.

Methodology

Summary:

The commenter suggests that the air quality analysis was overly general. The analysis should include emission factors and methodologies to quantify peak daily and/or peak yearly impacts from RDEP alternatives and should compare the impacts with local, regional, state of Arizona, and/or federal air emissions thresholds.

Response:

The RDEP identifies lands across Arizona that are most suitable for the development of renewable energy. This proposed land use allocation is at the planning-level scale and would not authorize any

specific projects or imply such approval. Any proposal for a wind or solar energy project will still require site specific permitting, additional environmental analysis, and NEPA compliance. The environmental consequences presented in this EIS document the types and general magnitude of impacts that could be anticipated from typical solar and wind energy developments.

While the reasonably foreseeable development scenario provides a magnitude of development in megawatts, and the alternatives recommend where such development could occur in general, the timing, location, and technology of such development would depend on specific development proposals. Any proposal for a solar or wind development will require due diligence, including National Environmental Policy Act (NEPA) compliance; this analysis could include a quantitative accounting of potential emissions and an analysis of a project's adherence to the general conformity rule and Prevention of Significant Deterioration increments, as applicable. Proposed site-specific development actions would also be subject to local air quality permitting requirements. The ROW application process would require implementation of a Dust Abatement Plan and other design measures and best management practices, such as those contained in Appendix B of the EIS. Additional measures could also be required, as determined during both the BLM application process and the local permitting process.

Comments:

Submission No: RDEP-Drft-0042

Commenter: Kirk Brus, Army Corps of Engineers

Comment: 2. Chapter 4.2.1 Air Quality and Air Quality-related Values. The Draft EIS does not contain or discuss quantitative air quality emissions calculations/analyses from the RDEP proposed project alternative construction and/or operation. The Draft EIS should contain sufficient quantitative technical data to permit a full assessment of all potentially significant air quality environmental impact(s). To quantify potentially significant air quality impacts, construction impacts, in particular should include the emission factors and methodologies that are used to establish peak daily (and/or peak yearly) impacts from the RDEP proposed project alternative (s). The evaluation of potentially air quality impacts from the RDEP proposed project alternative should at a minimum include emissions from all on-road mobile sources and offroad mobile sources for construction and transportation equipment on both construction and operation for the RDEP proposed project alternative(s). Making qualitative statements in Chapter 4.2.1 such as: "PV solar facilities would result in negligible emissions of criteria air pollutants from operation of the solar generating equipment itself. Operation of a PV solar facility would result in minor emissions from personal and maintenance vehicles, limited delivery trucks, and limited equipment exhaust, as well as fugitive dust emissions from windborne dust and dust generated by vehicles on unpaved surfaces," and/or "Wind energy facilities would have negligible emissions associated with operation of the wind turbines themselves. Operational emissions would include minor levels of criteria pollutants from scheduled changes of lubricating and cooling fluids and greases, limited vehicle use for maintenance activities, and limited equipment exhaust from routine brush clearing," is not based on quantitative technical data to allow for an adequate and full assessment of all potentially significant air quality environmental impacts, and may not support the existing statements in Chapter 4.2.1 that the RDEP proposed project alternative would have negligible or minor emissions associated with the RDEP proposed project alternative as currently stated, with or without the incorporating Best Management Practices (BMPs) cited in Appendix B on the RDEP proposed project alternative. Also, NEPA requires disclosure, and not providing and/or not discussing quantitative air quality calculations analysis for the RDEP proposed project alternative(s) may not meet the NEPA requirement on disclosure.

Submission No: RDEP-Drft-0042
Commenter: Kirk Brus, Army Corps of Engineers
Comment: Without a quantitative air quality calculations analyses of the RDEP proposed project alternative(s) including doing a comparison with local, regional, state (of Arizona) and/or Federal (National) air emissions thresholds, the RDEP proposed project alternative(s) could require a Conformity Determination per the Federal Clean Air Act (CAA). A reference, from the US Environmental Protection Agency, for air quality emissions calculations analyses is Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors, and can be found at the following weblink: http://www.epa.gov/ttnchie1/ap42/

Mitigation measures

Summary:

The commenter provides additional mitigation measures to be considered for design features and BMPs.

Response:

Measures similar to those suggested by the commenter to control dust during site preparation and construction were included in the table of BMPs that could be required for solar and wind development (see Table B-4 of Appendix B of the Draft EIS) and are designated as Measures 1 through 17; in the Final EIS, they are consolidated as design features and can be found in Appendix B. To expand on site restoration requirements, Measure 13 has been revised as follows: "Topsoil from all excavations and construction activities shall be salvages and reapplied during reclamation or, where feasible, used for interim reclamation by being reapplied to construction areas not needed for facility operation as soon as activities in that area have ceased. Unused topsoil and other erosion-susceptible material shall be removed from the site via covered trucks."

Comments:

Submission No: RDEP-Drft-0059
Commenter: Diane L. Arnst, Arizona Department of Environmental Quality, Air Quality Division
Comment: The following measures are recommended to reduce disturbance of particulate matter, including emissions caused by strong winds as well as machinery and trucks tracking soil off the construction site:

I. Site Preparation and Construction
A. Minimize land disturbance;
B. Suppress dust on traveled paths which are not paved through wetting, use of watering trucks, chemical dust suppressants, or other reasonable precautions to prevent dust entering ambient air;
C. Cover trucks when hauling soil;
D. Minimize soil track-out by washing or cleaning truck wheels before leaving construction site;
E. Stabilize the surface of soil piles; and
F. Create windbreaks.

II. Site Restoration
A. Revegetate any disturbed land not used;
B. Remove unused material; and
C. Remove soil piles via covered trucks.

G.2.2 Alternatives

Design Features and Best Management Practices

Summary:

The commenters provide new BMPs and design features that the BLM should consider, including those for transportation, lands with wilderness characteristics, and wildlife. Additionally, the commenters provided critiques and suggested changes to BMPs 4, 27, 31, 100, 131-132, 136, 142-143, and 145.

Response:
The RDEP identifies lands across Arizona that are most suitable for the development of renewable energy. This proposed land use allocation is at the planning-level scale and would not authorize any specific projects or imply such approval. Any proposal for a wind or solar energy project will still require site specific permitting, additional environmental analysis, and NEPA compliance. The environmental consequences presented in this EIS document the types and general magnitude of impacts that could be anticipated from typical solar and wind energy developments.

Site specific mitigation measures would be applied to respond to the unique impacts and setting for a particular project.

All of the design features and BMPs listed in Appendix B were intended to avoid, minimize, or mitigate potential resource conflicts, such as impacts on critical wildlife habitat or impacts from siting a project near sensitive viewsheds. The design features and BMPs were reviewed in light of the revised design features of the Solar Energy Final Programmatic EIS and the Wind PEIS ROD. The BLM determined that most of the RDEP's suggested mitigation measures duplicated national program guidance; in order to reduce the duplication, RDEP's design features and BMPs have been modified to conform to the BLM's national solar energy and wind energy programs. Appendix B, Design Features and Best Management Practices, has been modified to incorporate by reference the national solar energy program design features, as described in the Solar Final Programmatic EIS. Only those design features and BMPs that are unique to Arizona and REDA lands are specifically noted in the revised Appendix B.

Many of the comments requested additional BMPs or changes to BMPs that would require more specific coordination and compliance with county planning requirements or involvement (Draft EIS BMP Nos. 4, 27, 31, 100, 131, 132, 136, 142, 143, and 145). The BLM national renewable energy programs have proposed programmatic design features which include many opportunities for local government involvement and consultation, such as:

- Make early contact with local officials, regulators, and inspectors to explore all applicable regulations and address concerns unique to solar power generation projects.
- Emphasize early identification of, and communication and coordination with, stakeholders, including federal, state, and local agencies, special interest groups, Native American tribes and organizations, elected officials, and concerned citizens.
- Consult with local agencies about potential impacts of development in or close to state or local special use areas, such as parks.
- Avoid lands identified as incompatible by local governments for renewable energy development.
- Compare preliminary site grading, drainage, erosion, and sediment control plans with applicable local jurisdiction requirements.
- Consult federal, state, and local "waterwise" guidelines, as applicable, for project development in the arid Southwest.
- Site facilities to maximize local, regional, and statewide economic benefits and coordinate with local and state entities, such as state and county commissions and planning departments.
- Site projects to minimize adverse effects on area housing markets and local infrastructure (e.g., schools and other public services) and to ensure adequate housing vacancy rates and local infrastructure support for workers and their families (Solar Final PEIS, Volume 7, pg. 48).

Additionally, commenters requested provisions for the appropriate disposal of the by-products of water treatment processes and additional measures to ensure that projects are sited so that public motorized access is kept open when existing roads are impacted by a project. There are several design features that address these concerns in Appendix B.

<u>Comments:</u>

Submission No: RDEP-Drft-0001

Commenter: Michael J. Lacey, Arizona Department of Water Resources

Comment: Table B-4, Best Management Practices, Page B-71. CSPs and, to a more limited degree, PV facilities require higher water quality than is likely to be found in the natural environment. As such, water treatment works are likely to be required. Provisions for the appropriate disposal of the by-products of the treatment processes should be added as a BMP.

Submission No: RDEP-Drft-0024

Commenter: Steve Saway

Comment: a. Table 1, Design Features. Recommend Table 1 include additional measures to ensure that projects are sited so that public motorized access is kept open when existing roads are impacted by the project. (The need for this is exemplified by the proposed Gillespie Solar Energy Zone that, if approved, would potentially block public motorized access along Agua Caliente Road and adjoining routes that lead to the Woolsey Peak and Signal Peak Wilderness areas.) For example, on page B-29, under the "Transportation" category, a measure could be added as follows: "A public access plan will be developed to identify alternate motorized routes if a project cannot be sited to avoid impacting existing motorized routes. Project siting will honor all access routes established by the current resource or travel management plan or else provide for suitable alternate routes. "(Appropriate language should also be added to Table 2, Required Plans.) Also, on page B-6, under the category that is titled "Designated Areas with Wilderness Characteristics", the measures are actually applicable to a broader context. Recommend this category be defined as "Unique, Important, or Sensitive Areas". Item 18 under this category could be revised to read as follows: "Renewable energy facilities shall be located and designed to minimize impacts on the viewshed of specially designated visually sensitive areas, including units of the National Landscape Conservation System, Backcountry Byways, designated areas with wilderness characteristics, or areas managed by other federal, state, and local agencies."

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: Wildlife Connectivity: The Mohave REDA is traversed by the large Detrital Wash which may provide connectivity for key wildlife species including pronghorn antelope. RDEP's design features and best management practices should ensure continued access for wildlife through the site to limit habitat fragmentation.

Submission No: RDEP-Drft-0043

Commenter: Karl Taylor, Mohave County Public Works

Comment: BMP No. 4- The recommend measure is too broad and does not include specification of an assessment method for planning purposes. Further, it does not account for various factors affecting wind generated dust emissions, such as nonerodible elements, crust formation, frequency of mechanical disturbance, wind gusts, and wind accessibility.

Submission No: RDEP-Drft-0043

Commenter: Karl Taylor, Mohave County Public Works

Comment: BMP No. 27- New roads constructed on public rights-of-way shall satisfy local government adopted engineering standards for road design, drainage design, construction, and operation. If part or all of BLM road design standards provide more stringent requirements, then BLM standards should govern provided local government concurrence to assure no undue impact on future maintenance and

operational requirements to a local government jurisdiction which potentially may assume future maintenance of proposed new roads.

Submission No: RDEP-Drft-0043
Commenter: Karl Taylor, Mohave County Public Works
Comment: BMP No. 31 - Recommend adding use of nonhazardous and noncorrosive agents in road pavement structure construction.

Submission No: RDEP-Drft-0043
Commenter: Karl Taylor, Mohave County Public Works
Comment: BMP No. 100 -The reference to Traffic Management Plan is too broad in nature and should be expressed under local government planning and operations requirements. Planning requirements may include completion of a Traffic Impact Analysis to identify and properly plan road infrastructure necessary to provide construction and post-construction access to the developed site as well as provide information and data on traffic load (volume and vehicle class/weight) for evaluation of impacts and mitigation requirements on existing local government unpaved and paved roads serving the development. Operations requirements involve obtaining all required State and local government right-of-way use and oversize/overweight vehicle permits pertinent to site construction work and routine operations.

Submission No: RDEP-Drft-0043
Commenter: Karl Taylor, Mohave County Public Works
Comment: BMP No. 131 - Construction grading on property under local government jurisdiction shall adhere to that jurisdiction's permitting requirements and subject to pertinent adopted standards.

Submission No: RDEP-Drft-0043
Commenter: Karl Taylor, Mohave County Public Works
Comment: BMP No. 132- New roads constructed on public rights-of-way shall satisfy local government adopted engineering standards for road design, drainage design, construction, and operation. If part or all of BLM road design standards provide more stringent requirements, then BLM standards should govern provided local government concurrence to assure no undue impact on future maintenance and operational requirements to a local government jurisdiction which potentially may assume future maintenance of proposed new roads

Submission No: RDEP-Drft-0043
Commenter: Karl Taylor, Mohave County Public Works
Comment: BMP No. 136- This measure may be interpreted as a variance to road design standards mandated under other BMP measures on existing road reconstruction and new road construction. Recommend clarifying to remove any unintended interpretation.

Submission No: RDEP-Drft-0043
Commenter: Karl Taylor, Mohave County Public Works
Comment: BMP No. 142 - An access road siting and management plan shall in addition address local government planning requirements. Planning requirements may include completion of a Traffic Impact Analysis to identify and properly plan road infrastructure necessary to provide construction and post-construction access to the developed site as well as provide information and data on traffic load (volume and vehicle class/weight) for evaluation of impacts and mitigation requirements on existing local government unpaved and paved roads serving the development.

Submission No: RDEP-Drft-0043
Commenter: Karl Taylor, Mohave County Public Works
Comment: BMP No. 143 - The reference to Traffic Management Plan is too broad in nature and should be expressed under local government planning and operations requirements. Planning requirements may include completion of a Traffic Impact Analysis to identify and properly plan road infrastructure necessary to provide construction and post-construction access to the developed site as well as

provide information and data on traffic load (volume and vehicle class/weight) for evaluation of impacts and mitigation requirements on existing local government unpaved and paved roads serving the development. Operations requirements involve obtaining all required State and local government right-of-way use and oversize/overweight vehicle permits pertinent to site construction work and routine operations.

Submission No: RDEP-Drft-0043
Commenter: Karl Taylor, Mohave County Public Works
Comment: BMP No. 145- The use of "only if in safe and environmentally sound locations" when referring to a shall (requirement) of existing road use invokes subjectivity on what represents a safe and environmentally sound location without specification of engineering-based standards and/or jurisdiction standards or rules.

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: BMP No.4 - The recommend measure is too broad and does not include specification of an assessment method for planning purposes. Further, it does not account for various factors affecting wind generated dust emissions, such as nonerodible elements, crust formation, frequency of mechanical disturbance, wind gusts, and wind accessibility.

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: BMP No. 27 - New roads constructed on public rights-of-way shall satisfy local government adopted engineering standards for road design, drainage design, construction, and operation. If part or all of BLM road design standards provide more stringent requirements, then BLM standards should govern provided local government concurrence to assure no undue impact on future maintenance and operational requirements to a local government jurisdiction which potentially may assume future maintenance of proposed new roads.

Submission No: RDEP-Drft-0058
Commenter: Mohave County Board of Supervisors
Comment: BMP No. 31 - Recommend adding use of nonhazardous and noncorrosive agents in road pavement structure construction.

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: BMP No. 100 - The reference to Traffic Management Plan is too broad in nature and should be expressed under local government planning and operations requirements. Planning requirements may include completion of a Traffic Impact Analysis to identify and properly plan road infrastructure necessary to provide construction and post-construction access to the developed site as well as provide information and data on traffic load (volume and vehicle class/weight) for evaluation of impacts and mitigation requirements on existing local government unpaved and paved roads serving the development. Operations requirements involve obtaining all required State and local government right-of-way use and oversize/overweight vehicle permits pertinent to site construction work and routine operations.

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: BMP No. 131 - Construction grading on property under local government jurisdiction shall adhere to that jurisdiction's permitting requirements and subject to pertinent adopted standards.

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: BMP No. 132 - New roads constructed on public rights-of-way shall satisfy local government adopted engineering standards for road design, drainage design, construction, and operation. If part or all of BLM road design standards provide more stringent requirements, then BLM standards should govern provided local government concurrence to assure no undue impact on future maintenance and

operational requirements to a local government jurisdiction which potentially may assume future maintenance of proposed new roads.

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: BMP No. 136 - This measure may be interpreted as a variance to road design standards mandated under other BMP measures on existing road reconstruction and new road construction. Recommend clarifying to remove any unintended interpretation.

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: BMP No. 142 - An access road siting and management plan shall in addition address local government planning requirements. Planning requirements may include completion of a Traffic Impact Analysis to identify and properly plan road infrastructure necessary to provide construction and post-construction access to the developed site as well as provide information and data on traffic load (volume and vehicle class/weight) for evaluation of impacts and mitigation requirements on existing local government unpaved and paved roads serving the development.

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: "BMP No. 143 - The reference to Traffic Management Plan is too broad in nature and should be expressed under local government planning and operations requirements. Planning requirements may include completion of a Traffic Impact Analysis to identify and properly plan road infrastructure necessary to provide construction and post-construction access to the developed site as well as provide information and data on traffic load (volume and vehicle class/weight) for evaluation of impacts and mitigation requirements on existing local government unpaved and paved roads serving the development. Operations requirements involve obtaining all required
State and local government right-of-way use and oversize/overweight vehicle permits pertinent to site construction work and routine operations."

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: BMP No. 145 - The use of "only if in safe and environmentally sound locations" when referring to a shall (requirement) of existing road use invokes subjectivity on what represents a safe and environmentally sound location without specification of engineering-based standards and/or jurisdiction standards or rules.

Development Incentives

Summary:

The commenters suggested additional developer incentives for the BLM to consider as part of the RDEP. These include applying the incentives from the Solar Program IMs to projects of any size (not just developments that are greater than 20 megawatts), policies for processing priority project applications (such as those sited in REDAs versus non-REDAs), 30-year terms on renewable energy ROWs, lower rental fees, and a comprehensive mitigation program.

Response:

RDEP will follow the national solar and wind program policy and guidance, which would include the requirements presented in the Solar Program IMs. The national solar program is developing incentives through a formal rulemaking process that is scheduled to be completed in 2013. In addition to the national program guidance, RDEP is considering some additional incentives for development in the REDAs as presented in the Draft EIS, including streamlined ROW processing for utility-scale solar by

providing analysis that meets much of the national solar program's variance process, giving renewable energy development first priority over other land uses within REDAs while honoring valid existing rights, giving renewable energy development applications within the REDAs the first priority processing over applications located outside of the REDAs, and giving electricity transmission projects and needs related to renewable energy development applications within the REDAs priority location and processing over these applications outside of the REDAs (Draft EIS, pg. 2-13). Lands outside REDAs would not receive priority processing, but application on lands with minimal sensitive resources would likely require less environmental review and mitigations making the processing process simpler.

The BLM's current rental policy is interim and will continue to be evaluated to ensure the government is getting the best value for public lands and that the rates are favorable to promote economic growth. Under most circumstances ROW grant holders can request to renew an expiring 30 year grant. The BLM may grant that renewal if they are in good standing and if they can demonstrate that there is a public and market need for that use of public land. Most power purchase agreements are 20 years, therefore a 30 ROW grant allows for that 20 year power purchase agreement, construction, decommissioning, and reclamation.

Comments:

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: What has not been addressed in the DEIS are the financial and technical capability of the applicant as a factor for variance applications. We offer some recommendations in our "Incentives" section that should help meet these requirements.

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: Recommendations: We encourage Arizona BLM to make clear its expectation of a more efficient permitting process for applications in REDAs. In addition, we suggest that variance applications in REDAs that have been screened for economic and technical viability (consistent with BLM Instruction Memoranda IM 2011-060) be processed before variance applications outside of REDAs. Finally, establishing a comprehensive mitigation program for developers to take part in would benefit both developers and Arizona BLM. The goals of such a program should be to simplify and improve the mitigation process for future projects.

Submission No: RDEP-Drft-0025
Commenter: Christopher Lish
Comment: Second, the BLM should develop additional incentives for developers to put projects in low-conflict sites identified in the plan. By making it more economical and efficient to build there, it will reduce the likelihood of projects being built in other areas with sensitive wildlands and wildlife habitat.

Submission No: RDEP-Drft-0005
Commenter: Katherine Gensler, Solar Energy Industries Association
Comment: Many of these proposals mimic the current policies for utility-scale (greater than 20 MW) solar projects, as spelled out in several 2011 Instructional Memoranda. These economic incentives should accrue to any project in a REDA, regardless of its size.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: We encourage Arizona BLM to make clear its expectation of a more efficient permitting process for applications in REDAs. In addition, we suggest that projects in REDAs that have been screened for economic and technical viability (consistent with BLM Instruction Memoranda IM 2011-060) automatically qualify for the "Priority

Projects" list or other priority processing scheme that BLM institutes, and are otherwise processed before non- REDA applications

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: To make the REDAs more attractive to developers, we propose these economic incentives. Many of these proposals mimic the current policies for utility-scale (greater than 20 MW) solar projects, as spelled out in several 2011 IMs. These economic incentives should accrue to any project in a REDA, regardless of its size.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Recommendations: A long-term lease is of great importance to solar developers, as the ROW term needs to match the duration of the power purchase agreement signed with the utility customer plus the project's construction time. Therefore, we request a minimum ROW term of 30 years, with the opportunity to renew. In addition, we suggest that ROW grants have a flexible duration, such that the applicant could choose an initial ROW grant of more than 30 years, if so desired

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: In addition, lower rental fees will make development in REDAs a more attractive proposition. While ASWG was unable to agree upon specific recommendations for reduced rental rates, we do agree that applications in REDAs should receive some kind of reduced rental rate, so long as the rate still provides fair market value for the use of public lands.

Submission No: RDEP-Drft-0005
Commenter: Katherine Gensler, Solar Energy Industries Association
Comment: Finally, establishing a comprehensive mitigation program for developers to take part in would benefit both developers and Arizona BLM. The goal of such a program should be to reduce costs to the developer while better meeting the mitigation needs of Arizona BLM. Up-front information about what mitigation is necessary and a list that outlines options a developer may take to satisfy the mitigation requirements would create a smoother process for all involved.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Finally, establishing a comprehensive mitigation program for developers to take part in would benefit both developers and Arizona BLM. The goals of such a program should be to reduce costs and simplify and improve the mitigation process for future projects. Developers should know in advance what mitigation measures may be and have a list of options to comply.

Submission No: RDEP-Drft-0065
Commenter: The Wilderness Society
Comment: Second, the BLM should develop additional incentives for developers to put projects in low-conflict sites identified in the plan. By making it more economical and efficient to build there, it will reduce the likelihood of projects being built in other areas with sensitive wildlands and wildlife habitat.

Submission No: RDEP-Drft-0003
Commenter: Amanda Ormond, Interwest Energy Alliance
Comment: Recommendation 6 – Developer-Obtained Information
Project developers are responsible for performing or having performed myriad assessments of lands they are proposing to develop. From these evaluations developers may have additional or more up-to-date information than the Department. Interwest believes that if a developer can show the Department that the area proposed for development has the same characteristics as REDA lands the Department should have a process to allow that proposed project land to be designated as "REDA lands" for

the purpose of the developer receiving incentives (see recommendation 3 for more information on incentives).
Interwest recommends that the Department allow developers to receive incentives for siting on non-REDA lands if the developer can demonstrate that the proposed project parcel has the same characteristics as REDA lands.

Disposal

Summary:

Mohave County would like the BLM to make the commitment that land swaps would not result in a net loss of private lands in the county.

Response:

BLM would review any proposal for sale or exchange of lands marked for disposal in a current RMP on a case-by-case basis. However, should a willing partner propose the sale or exchange of lands, all applicable policy and guidance on disposal of BLM lands would be followed including coordinating and consulting with Arizona state agencies and local government and agencies. This requirement for consultation is also reiterated as a management action considered as part of the alternatives in RDEP (see Land Tenure Management Actions in the Draft EIS, pg. 2-13).

Any land tenure adjustments for BLM-administered lands, whether as part of a REDA or outside a REDA, would solely be for lands that have been previously identified for disposal in current RMPs. The process would be conducted on a case-by-case basis RDEP is not considering new disposal decisions..

Comments:

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: The County is also very concerned about the potential loss of additional private lands available for development. Specifically, Mohave County would like a commitment from the BLM, as a part of this program, to the effect that no BLM land swaps or sales result in a net loss of private, usable land within Mohave County.

Elimination Criteria

Summary:

The BLM needs to better explain how it applied the wildlife-related screens, including Arizona's Game and Fish Department's Species and Habitat Conservation Guide (Species and Habitat Conservation Guide), as well as how other screens were developed, selected and applied, or rejected.

Response:

The RDEP REDA GIS methodology has been included as in the online GIS metadata (see RDEP project Web site). The metadata details what was used to create the REDA screens, the queries or boundaries placed on the REDA screen data, information on the decision process. In some instances, such as data layers or information supplied by cooperating agencies (e.g., the AGFD Species Habitat Conservation Guide), the screens' methodologies are briefly summarized and noted as incorporated by reference. Full information on these data would be available from the source agency or organization.

Comments:

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: Without the needed information, we are left with a very general understanding of the way in which BLM applied the wildlife-related screens, including AGFD's Species and Habitat Conservation Guide (Species and Habitat Conservation Guide). The narrative provided for the application of the AGFD's Species and Habitat Conservation Guide is very general (DEIS, pages 4-42 and 4-46), and does not provide sufficient detail as to how other screens, such as those related to big game were developed, selected (or rejected) and applied.

Additional Buffer

Summary

The BLM should include a one-kilometer buffer to the wildlife linkages screening model.

Response

Beier wildlife linkages were used as a REDA screen in the Draft EIS. The BLM reviewed using a 1 km buffer around these wildlife linkages as a REDA screen. The analysis concluded that using Beier wildlife linkages 1 km buffer may or may not suitable as wildlife corridors depending on site conditions. The identification of a REDA is at the planning-level scale and would not authorize any specific projects or imply such approval. Any proposal for a wind or solar energy project will still require site specific permitting, additional environmental analysis, and NEPA compliance. Project specific analysis would include an accounting of any potential wildlife corridors/linkages.

Comments:

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: Recommendation: Documented wildlife linkages and areas important for habitat connectivity should be excluded from REDAs, even as their more formal scientific documentation is pending, so as to preserve their integrity and functionality. Both solar and wind development have a high potential to cause habitat loss, fragmentation and disturbance that could render these important linkages ineffective. This is of particular concern for intervening lands that may not rank high in terms of biological diversity, but play an important role in terms of facilitating crucial dispersal and migration events for wildlife. Defenders supports the BLM's use of the AGFD / NAU Beier Lab subset of priority modeled wildlife linkages as a screen. In addition, we recommend including a 1 km buffer screen surrounding these linkages in order to protect their functionality (i.e. reducing edge effects associated with development and human activities). We recommend that upon RDEP screens being revisited in the future, the most current modeled wildlife linkages for completed county-level assessments should be obtained by from the AGFD and utilized as screens, as were the AGFD / NAU Bier Lab subset of priority wildlife linkages.

Citizen's Proposed Wilderness

Summary:

The BLM should eliminate Citizen Proposed Wilderness lands from consideration as REDA.

Response:

The screening criteria for REDAs rely on formally designated special designations to be consistent with BLM guidance and handbooks on wilderness. Wilderness Areas and Wilderness Study Areas have been eliminated from REDAs, and most of the CPW areas are already screened out due to other resources

being present. An analysis of citizen proposed wilderness has been added to the Final EIS in Chapter 4, Environmental Consequences. Should citizen-proposed wilderness areas be designated as Wilderness Areas in the future, then they will be eliminated from any renewable energy development as noted in national solar and wind energy policy.

Comments:

Submission Nos: RDEP-Drft-0031 and No: RDEP-Drft-0033
Commenters: Kathy Lopez and Jeanie Watkins
Comment: Citizen's Proposed Wilderness (CPW) lands throughout Arizona should be screened out and removed from REDA lands. In the current EIS, the preferred alternative has only 500 acres of conflict, but the BLM can do a better job.
The proposed Agua Caliente Solar Energy Zone (SEZ) west of Gila Bend fails to avoid two Citizen Proposed Wilderness Areas. The proposed SEZ should be modified to avoid these areas and be exposed to the same environmental and cultural resource screens that other areas are.

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: Citizen's Proposed Wilderness Areas – These should be added as screens. These citizen-inventoried areas contain wilderness characteristics, are otherwise undisturbed, and lack evidence of substantive human development. As such, they are not low-conflict areas. GIS data for these areas is included in the enclosed CD, Attachment 1.

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: we advocate for all CWP units to be screened out 100%, to avoid the inclusion of, and future conflict with, any lands that have been documented to contain wilderness characteristics and values.

Cultural Resources

Summary:

The commenters suggest adding NRHP-listed sites, NRHP-eligible sites, and Native American sensitive sites and traditional cultural properties to the listing of screening criteria in Table 2-1, Areas with Known Sensitive Resources.

Response:

Due to the statewide scale of RDEP and the extensive presence of cultural resources throughout the state, it is impractical for Class III surveys to be conducted to identify all NRHP-eligible sites. Additionally, a complete review of the AZSITE database would not provide a full inventory of archaeological sites as less than 10 percent of the area in Arizona has been surveyed to current standards. As noted above, the REDAs identified in the alternatives are being considered for *potential* development. This proposed land use allocation is at the planning-level scale and would not authorize any specific projects or imply such approval. Any proposal for a wind or solar energy project will still require site specific permitting, additional environmental analysis, tribal consultations, and cultural resource program compliance, including following the National Historic Preservation Act (NHPA), associated regulations, and all BLM manuals. This would include conducting cultural resources inventories (e.g., Class III surveys) of the development proposal and a full analysis of the impacts on any resources found in the area of potential effect. In accordance with federal laws, regulations, and BLM policy, tribes will be invited to participate in pre-application meetings during the initial phase of project siting, which will facilitate early identification of traditional resources that could be affected by a proposed project. This process would improve efforts to identify and avoid impacts to TCPs and sacred

sites and could lead to changes in the location or boundaries of a project. See the Cultural Resources section below for additional information on affected environment and impact analysis requirements as part of RDEP and future NEPA analysis.

At this stage of screening for potential REDAs, the BLM did not use a single, statewide, cultural resources data layer as one of the screening criterion. However, the RDEP did use data from those areas that are well documented by the BLM (e.g., Sears Point) and that are known to contain highly unique or significant sites at risk, intact cultural landscape values, or significant cultural resources, due to high densities of archaeological sites (see the revised Table 2-1 in the Final EIS). Areas screened out from REDA specific due to sensitive cultural resources are as follows:

- House Rock Valley
- Poston Butte
- Petrified Forest Expansion Area
- Gila River Terraces
- Clanton Hills

Many of the most significant cultural resources on BLM-administered lands, including National Register-listed sites and districts (such as Sears Point, Painted Rocks, and Perry Mesa) are within National Monuments, National Conservation Areas, and Areas of Critical Environmental Concern that were eliminated from REDA consideration. Other locations and landscapes that were eliminated from consideration for various reasons, such as lands with wilderness characteristics, also are known to contain important cultural resources.

The EIS analysis reviewed current National Register listings to determine the presence or proximity of listed properties in relation to the REDAs and SEZs considered for the "Maximum REDA" alternative (Alternative 1). Approximately 90 of the total of 1,384 listed properties and districts in Arizona (about seven percent) are within or near the REDAs and SEZs. Most of these 90 properties are outside of proposed renewable energy areas but could potentially be affected by visual impacts. There are 19 National Register-listed properties on BLM-administered lands, all of which are managed for long-term preservation and protection. Some of these properties (such as Sears Point) could be affected by visual, auditory, or atmospheric impacts to their settings. The effects would need to be determined on a project-specific basis with efforts to avoid or mitigate any adverse effects.

The RDEP also includes the suite of design feature requirements that would be required as part of the design for renewable energy projects (see Appendix B in the Final EIS). Additionally, the BLM is committed to working with tribes and the Arizona State Historic Preservation Office on specific projects to avoid impacts on significant cultural resources.

<u>Comments:</u>

Submission No: RDEP-Drft-0020

Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes

Comment: The screen, however, includes virtually no consideration of cultural resources. ES-b to 11. The list does not include sites or districts listed on the National Register of Historic Places, nor does it include other previously identified cultural resource sites. Other than the Gila River Terraces, which are a proposed cultural resources ACEC, the list includes no traditional cultural properties or other areas sacred to tribes. As the DEIS recognizes, the identified REDA therefore "could include lands where there are tribal interests and heritage

resources that are not currently identified." DEIS 4-71; see also DEIS 4-72 ("Impacts are discussed generically, because the presence, absence, or location of tribal interests and heritage resources and their relation to potential renewable energy development are not fully known and would be identified through project-specific consultations."); DEIS App. 4-3 ("Potential effects on cultural resources in adjacent areas, or tribal concerns such as visual impacts or access issues relating to places of traditional importance, could raise issues that would need to be addressed through the Section 106 of the NHPA consultation process).

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: "In addition, deferral of cultural resource identification is inappropriate because the purpose of the RDEP is to provide guidance on "where development should occur." DEIS 1-3 (emphasis added). The RDEP sets the ball in motion for fast-paced, streamlined develop of solar and wind resources on BLM-administered land. DEIS ES-2. Even assuming future surveys and tribal consultation are completed when project-specific development is proposed, it will be exceedingly difficult to change course at that future juncture, given the significant investment of time and resources by both BLM and the developer. The DEIS acknowledges as much, stating that due to the small size of BLM's preferred alternative "if heritage resources were discovered within the REDA, it would be more difficult to move or microsite any proposed development." DEIS 2-57. By identifying cultural resources before significant bureaucratic and financial momentum builds for a particular project, the RDEP could avoid repeatedly re-creating the problems that have arisen at Genesis.

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: Without directly explaining this omission, the DEIS hints at various excuses for failing to exclude areas of potential cultural resource significance. First, the DEIS suggests that because little is currently known about cultural resources across the state of Arizona, and because this DEIS has a "programmatic focus" (DEIS ES-7), it is appropriate to defer analysis of cultural resources to a later time. The argument is wrong on both the facts and the applicable law. The DEIS acknowledges that data on previously recorded sites already exists in the Arizona Archaeological Site and Survey Database and in National Register of Historic Places. DEIS 3- 13.There is no reason that this information cannot be included in the screen; indeed, it is necessary to include it to ensure that the REDAs actually represent areas of low resource sensitivity. In addition, the DEIS claims that consultation with affected tribes began early, in order to "thoroughly consider[] cultural resources in [all] environmental analysis. DEIS ES-5, see also DEIS 1-22. The RDEP should not be approved and the EIS should not be certified until consultation has progressed sufficiently to identify all resources of significance to tribes, so that they can be eliminated from the final REDAs. See DEIS 3-11 (BLM acknowledges that it "is obligated under the [NHPA], FLPMA, NEPA, and agency policy to protect cultural resource values and to consider and mitigate the potential impact of proposed activities and land use plans."). If desired by the affected tribes, a complete ethnography should be completed of the region to aid in this identification.

Deletion

Summary:

Commenters suggest that the following REDA screening criteria be eliminated: VRM Class III, Airports, Areas of Known Mineral Deposits, incorporated cities, and floodplains.

Response:

The BLM reviewed the commenters list of elimination criteria suggested for deletion and made the following findings and conclusions:

- VRM Class III areas: While it may be possible to site renewable energy developments within VRM Class III areas, this management objective class is known to have constraints that could make siting difficult. Considering that RDEPs stated purpose is to allow the permitting of future renewable energy development projects to proceed in a more efficient and standardized manner and occur in areas with the fewest known constraints, keeping VRM Class III as a screening criteria meets the purpose for RDEP. VRM Class III areas would still be available for application. Airports: Based on public comments noting that airports could be very good sites for renewable energy development and subsequent review by BLM, airports were deleted from Table 2-1.
- Areas of known mineral deposits: Arizona has a large potential for development of various mineral deposits. Harvesting many minerals requires significant land disturbance. To avoid conflicts between mining and renewable energy, areas with the highest potential of subsurface minerals were used as a screen. As reflected in RDEP, BLM supports the reuse of disturbed lands and proposes management measures that would facilitate renewable energy development at mining sites. Unless REDAs are petitioned for withdrawal as a future action, lands with mineral resources would be managed under applicable minerals laws and regulations.
- Floodplains: BLM acknowledges that some floodplains could be disturbed and therefore be suitable for renewable energy development. However, many floodplains are still undisturbed and have resource constraints such as possible sever erosion and other resource concerns. Based on these constraints, BLM decided to keep floodplains as an elimination criterion in Table 2-1. However, it's important to note that development could still be permitted on the lands outside of REDA.
- Slope: As slope increases there is a higher potential for resource conflicts, including erosion, gullying, habitat loss, alteration of nutrient cycling, and changes to local hydrological conditions. BLM expects that REDAs will be areas of low resource conflicts; therefore, slope serves as a valid screening tool.

Comments:

Submission No: RDEP-Drft-0003

Commenter: Amanda Ormond, Interwest Energy Alliance

Comment: "Recommendation 7 - Changes to Screening Process

There are several layers that were incorporated in the process that we believe are unnecessary or inappropriate to identify low-conflict lands.

• Remove BLM Visual Resource Management Classes 3. These areas are currently available for mineral and wind energy development and should be allowed for renewable energy development under the RDEP process.

• Remove Airports (.25 mile buffer) as a screen. Airports can provide an ideal location for development of solar resources. The U.S. Air Force and airports (Prescott Airport and Denver International Airports) are examples.

• Remove Areas of Known Mineral Deposits – Land use for mining and renewable energy generation are not automatically incompatible and should be allowed where appropriate. "

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: FEMA 100-year Floodplains – In the state of Arizona, a number of human-made structures have been developed to collect and channel floodwaters away from vulnerable infrastructure and

facilities. In many instances, these installations create floodplains that may be perfect for the development of some renewable energy facilities. Therefore, ASWG recommends that floodplains be removed as a screen, recognizing the likelihood that many of these areas may be good candidates for solar development. In other circumstances, however, there are natural floodplains that retain critical ecological value that should not be developed. Such areas may include ephemeral washes, xeroriparian areas, seasonally dry rivers, wetlands, agricultural ponds, and a variety of other mapped floodplains that retain valuable resources that preserve the viability of wildlife in the arid Arizona climate. Thus, we encourage the BLM to take special care when evaluating project-specific sites within and around 100-year floodplains to ensure that impacts to critical resources are limited.

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: Airports (.25 mile buffer) – These should be removed as a screen. As demonstrated at various airports and military airfields and bases, solar generation can be compatible in or near airports or flight facilities. A recent report by the US Department of Agriculture evaluating the potential for alternative energy production at airports notes that “with careful planning, locating alternative energy projects at airports could help mitigate many of the challenges currently facing policy makers, developers, and conservationists” (DeVault et al. 2012).
Incorporated Cities – These should be removed as a screen. Cities and towns in Arizona are considering establishing Renewable Energy Incentive Districts and other zoning designations that encourage solar at various scales within their jurisdictions. This screen is not consistent with such efforts.

Areas of Known Mineral Deposits – These should be removed as a screen. Mining and solar or wind generation are not inherently incompatible activities and, in certain instances, could be co-located.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Areas of Known Mineral Deposits – These should be removed as a screen. Mining and solar or wind generation are not inherently incompatible activities and, in certain instances, could be co-located.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Airports (0.25 mile buffer) – These should be removed as a screen. As demonstrated at various airports and military airfields and bases, solar generation can be compatible in or near airports or flight facilities. A recent report by the US Department of Agriculture evaluating the potential for alternative energy production at airports notes that “with careful planning, locating alternative energy projects at airports could help mitigate many of the challenges currently facing policy makers, developers, and conservationists” (DeVault et al. 2012).

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Incorporated Cities – These should be removed as a screen. Cities and towns in Arizona are considering establishing Renewable Energy Incentive Districts and other zoning designations that encourage solar at various scales within their jurisdictions. This screen is not consistent with such efforts.

Geographic Information System Data

<u>Summary:</u>

The commenter suggests adding The Nature Conservancy’s ecoregional conservation assessment datasets to the Areas with Known Sensitive Resources.

Response:

The BLM used its national and Arizona datasets for sensitive species habitat, and AGFD data sets for sensitive species locations and Species Habitat Conservation Guide as REDA-eliminated criteria. The Nature Conservancy ecoregional assessments were reviewed, and BLM found that they also incorporated AGFD data for ESA listed species and BLM sensitive species, and overlapped with much of the RDEP datasets. The BLM will continue to evaluate data sets for site specific analysis if future developments are proposed within REDAs.

Comments:

Submission No: RDEP-Drft-0009

Commenter: Rob Marshall, MFS, The Nature Conservancy

Comment: "Areas of regional significance identified in ecoregional assessments often include species listed under the ESA or important terrestrial and aquatic wildlife habitat needed to ensure wildlife populations remain viable and do not warrant protection under the ESA. While some areas identified in ecoregional assessments do not have special designations or special status species, their regional importance in maintaining non T&E species, healthy watersheds and the continued provisioning of ecosystem services qualifies these areas as having recognized values and high sensitivity to impacts from habitat conversion.

Table 1a lists the acres of overlap between BLM's preferred alternative and grasslands with the highest ecological integrity in Arizona. Table 1b identifies the specific areas where BLM's preferred alternative overlaps with areas of regional conservation importance and the percentage overlap, which gives an indication of the magnitude of impact if development were to proceed in these areas.

Table 1a. Acres overlap between native, intact grasslands in Arizona and the RDEP preferred alternative on BLM and non-BLM lands. Grasslands listed by TNC ecoregion in which they occur. Grasslands are native dominated grasslands (Class A = native grasslands with less that 10% shrub cover; Class B = native grasslands with 10-35% shrub cover) or sacaton grasslands (Class C) from TNC grasslands assessment (2004).

Submission No: RDEP-Drft-0009

Commenter: Rob Marshall, MFS, The Nature Conservancy

Comment: 1) Add regional conservation datasets to the analysis used to identify Areas with Known Sensitive Resources. BLM has made significant progress in identifying REDAs lands with low resource sensitivity. Two important regional conservation assessments that identify sensitive biological resources were omitted from the analyses: The Nature Conservancy's ecoregional conservation assessments for the state and the statewide grassland assessment. Overlaying the proposed REDAs with these datasets reveals several additional areas with biological values of regional importance that meet the criteria for "Areas with Known Sensitive Resources". These areas should also be excluded from REDA consideration. These assessments were derived using the best available science to identify lands and waters of regional conservation significance. Extensive data from state, federal and other regional datasets along with expert knowledge was captured in a scientifically repeatable process from multiple stakeholders across government and non-governmental agencies, tribal interests and the private sector. These datasets have been used widely as environmental screens and are publically available for download (http://azconservation.org/).

Black Mesa

Summary:

The BLM should consider additional data to screen for REDAs in the Black Mesa area.

Response:
BLM initiated consultation with affected tribes early in the RDEP development process. As a matter of practice, the BLM coordinates with all tribal governments, associated native communities, native organizations, and tribal individuals whose interests might be directly and substantially affected by activities on public lands. As tribes are sovereign nations, the BLM only considered requests for consultation and inclusion of tribal lands through federally recognized tribal governments and agencies. During consultation, tribes identified their interests and concerns in regard to developing renewable energy projects on tribal lands, adjacent lands, and traditional territories, and highlighted a desire to better understand the nature, benefits, costs, and environmental impacts of various technologies. However, the tribes did not become formal cooperating agencies, did not express an interest for BLM to include tribal lands as part of the planning and analysis area, and, apart from one exception no tribe submitted nominated sites from tribal lands for consideration as part of RDEP. As a result, tribal lands were not included in the RDEP planning area or the analysis area. The Final EIS has been updated to include this explanation.

The BLM is committed to ongoing consultation with tribes after RDEP; the BLM would be able to provide information and analysis to help inform tribal governments and agencies, and serve as a resource for the tribal members, policy makers, and energy planners that are considering renewable energy projects on their lands. This could include providing the screening criteria (the resources noted in Table 2-1) used to define REDAs to tribes to use if they would like to do a similar screening process on their lands.

Comments:
Submission No: RDEP-Drft-0060
Commenter: Beth Rivers, Indigenous Support Coalition of Oregon
Comment: Please use data from the report written by Southwest Research and Information Center for your analysis: http://coaldiver.org/documents/black-mesa-solar-potential-report-2010 Black Mesa has the slope, the radiance, the acreage, the roads, access and proximity to transmission facilities with right-of-ways already established; it already has had resource clearances and resources removed, and wells are available for the water needed without any danger of depleting the aquifer or contaminating streams by solar operations. (See pages 2, 4-9) http://empowerblackmesa.org/docs/JJClacs/BMESA_Maps_%20FINAL.pdf

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Non-BLM Lands
Summary
The BLM should apply the screening criteria to all non-BLM-administered lands (private and state), not just BLM-administered lands.

Response
The BLM defined the RDEP planning and analysis areas as all lands within Arizona, except for Department of Defense and tribal lands. The REDA screening criteria, including big game layers provided by the AGFD, were applied across the entire planning area in order to provide analysis that would help inform state, tribal, and local governments and agencies and serve as a resource for the general public, policy makers, and energy planners that are considering renewable energy projects. The Final EIS has been revised to clarify what lands were considered in the planning and analysis areas and the rationale for doing so; see Section 1.6, Scope of the Analysis.

Comments:

Submission No: RDEP-Drft-0052

Commenter: Ginger Ritter, Arizona Game and Fish Department

Comment: The Department analyzed the affect these changes would have on the REDAs, both the maximum REDA and the Collaborative REDA (Appendix 1). While conducting this analysis, it appeared that the big game layers were only used on BLM administered lands. For consistency and to truly focus renewable energy development on lands with low resource sensitivity and few environmental conflicts, the big game layer exclusions should be applied to all lands regardless of ownership.

National Park System Units

Summary:

The commenter suggests additional lands that should be screened out from REDA consideration due to sensitive viewsheds near NPS units.

Response:

The BLM appreciates the importance of the setting, character, and resources of National Park System lands. How these lands could be impacted by renewable energy development is very dependent upon the proposed technology and site characteristics (e.g., topography, vegetation, wind direction, viewshed, wildlife corridors, and habitat). Therefore at the planning level it is difficult to conduct such site-specific analysis. To avoid conflicts with National Park System lands, the following management action has been added to the Final EIS in Chapter 2, Alternatives. It applies to all action alternatives and is consistent with direction in the Solar PEIS (BLM and DOE 2012).

Where a wind or solar energy development ROW application is submitted in a REDA that is in an areas identified by the National Park Service as having a high potential for conflict with the resources of a unit of the National Park Service or special areas administered by the National Park Service, additional documentation will be required. This documentation may include information to verify any or all of the following potential resource conditions resulting from the proposed project:

- Increased loading of fine particulates (criteria pollutants: PM 2.5 and PM10 [particulate matter with a diameter of 2.5 µm or less and 10 µm or less, respectively]) and reduced visibility in Class I and sensitive Class II areas;
- Atmospheric, auditory, or visual alterations to the settings of sites, structures, or trails that are managed for their historical, cultural heritage, or interpretive values;
- Enhanced public access that could increase the threat of damage or vandalism to cultural resources administered by the NPS;
- Altered frequency and magnitude of floods, and water quantity and quality;
- Reduced habitat quality and integrity and wildlife movement and/or migration corridors; increased isolation and mortality of key species;
- Fragmentation of natural landscapes;
- Diminished wilderness, scenic viewsheds, and night sky values on landscapes within and beyond boundaries of areas administered by the NPS; and
- Diminished cultural landscape qualities within and beyond boundaries administered by the NPS.

In response to NPS comments on the Solar Programmatic EIS, BLM-administered lands near Wupatki National Monument and Fort Bowie National Historic Site were eliminated from consideration as REDAs.

Comments:

Submission No: RDEP-Drft-0066
Commenter: John Wessels, National Park Service
Comment: "Another area of concern is that several alternatives, including the preferred alternative, identify state and private lands south and west of Pipe Spring NM as suitable for development of renewable energy projects. Because these tracts are in the immediate viewshed of Pipe Spring NM, such developments would be inconsistent with the historic scene and may potentially result in adverse effects to this historic viewshed. Specifically, these private and state lands are south and west of the Kaibab Paiute Reservation and include lands within the Kanab Creek Watershed and the Crest of Cedar Ridge. We request that the following lands be deleted from the non-BLM Administered lands identified for ""collaborative-based REDA.""
Township 39N, range 4W, all non-BLM sections
Township 39N, range 5W, all non-BLM sections
Township 39N, range 5W, all non-BLM sections
Township 40N, range 5W, Section 7, and Sections 16-36
Township 40N, range 6W, Sections 8-36
The location of solar infrastructure should be sensitive to the viewshed of Pipe Spring NM, and mitigation measures should be applied to minimize the visual intrusion from solar infrastructure."

Submission No: RDEP-Drft-0066
Commenter: John Wessels, National Park Service
Comment: In addition to our request under item 2) above [RDEP-EIS lands proposed for development that are in proximity to NPS units should be excluded from consideration until decisions on land exclusions and resource protection criteria are finalized in the Solar PEIS], NPS also requests all solar energy program lands identified by the NPS as areas having high potential for conflict with NPS-administered resources and located outside the RDEP-EIS preferred alternative be considered for exclusion from utility-scale solar development. Because the RDEP-EIS tiers off of the Solar PEIS, we believe that the Final RDEP-EIS should not be prepared prior to the Record of Decision on the Solar PEIS. This chronology would allow for greater specificity of potential impacts, avoidance and mitigation considerations, and a more informed decision-making process.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Proximity to Road to Lake Mead National Recreation Area: The National Park Service has expressed concerns about the proximity of this site to Temple Bar Road and the entrance to the recreation area.

Parcel Size

Summary:

The BLM should set a minimum parcel size and generation capacity as a requirement for REDAs; any parcel that would not meet the size/generation capacity requirement should be eliminated from consideration.

Response:

Based on commenter input, the BLM reviewed the areas with small REDA parcels and determined that it made sense to revise the screening criteria to eliminate parcels that are eight acres or less. However, in the case when the small parcel is immediately adjacent to a larger REDA, then it was encompassed into the larger REDA.

Comments:

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: Even though RDEP, unlike the Solar PEIS, is meant to examine renewable energy generation at all scales (not just utility-scale), we recommend that RDEP establish a minimum REDA parcel size, tied to a minimum generation capacity, for planning and analysis purposes. A minimum parcel size would reduce habitat fragmentation as a result of small developable REDAs (and all their attendant road, transmission, and other infrastructure) scattered across the landscape, reduce the difficulties in planning for and siting transmission, and would provide additional coherence in planning. In studies with the National Renewable Energy Laboratory (NREL) BLM has not used a minimum parcel size for solar PV generation planning, but has incorporated minimum sizes for wind (50 acres for grid connected sites) and solar CSP generation (40 acres). 3 By not using a minimum parcel size in the DEIS, the screening processes for alternatives 1 and 6 produced enormous numbers of REDAs, most of which are extremely small—26,082 in alternative 1, and 17,468 in alternative 6. The distribution of REDAs by size is such that while the vast majority of REDAs in both alternatives are very small, the vast majority of acreage is contributed by several hundred large parcels in both cases.

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: REDAs that are not large enough to support a minimum amount of renewable energy generation should be removed from consideration. According to the EPA4, it is generally not economical to develop an installation of less than 1 MW of solar energy on disturbed or degraded lands. Using the BLM's estimate of 8 acres/MW for solar development, unconnected REDAs smaller than 8 acres should therefore be excluded from final consideration. Approximately 67% of the REDAs are smaller than 8 acres, but removing them from alternatives 1 and 6 would result in a reduction of only 1.4% of total REDA acreage in both alternatives.

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: Recommendation: Following all other screening steps, any REDAs smaller than 8 acres (i.e. not capable of accommodating at least 1 MW of installed solar capacity) should be dropped if not immediately adjacent to another REDA such that the sum of the two REDAs is 8 acres or greater.

Slope

Summary:

Slope should be eliminated as a screening criterion as it is a rough rule of thumb that should not be used as the sole determining factor for determining the suitability of a parcel for solar development.

Response:

The purpose of RDEP is to identify those areas most suitable for renewable energy development, which included eliminating resources that are well documented and known to create conflicts when siting renewable energy projects. As slope increases there is a higher potential for resource conflicts, including erosion, gullying, habitat loss, alteration of nutrient cycling, increasing issues with species' habitat, and changes to local hydrological conditions. The purpose of REDAs is to minimize resource conflicts; therefore, slope serves as a valid screening tool.

Comments:

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: Slope – Slope is a technical criterion or constraint. It should be listed separately from other screening criteria. The 5% slope criterion is a rough rule of thumb for identifying ideal lands for solar development, but it should not be used as the sole determining factor as to the suitability of a parcel of land for solar development. With this in mind, we agree that there should be some flexibility to develop on lands with greater than 5% slope in limited circumstances and on an individual project basis. For example if a proposed project is located up to 33% outside of a REDA on lands with greater than 5% slope but that otherwise meet RDEP's screening criteria, then this project should be treated as a REDA project. Implementation of this proposal should be consistent with the recommendations outlined in the January 27, 2012, "Joint Comments on the Supplemental Draft PEIS for Solar Development" submitted by the 21 parties that comprised the California Desert Renewable Energy Working Group.

Species Habitat Conservation Guide Tiers

Summary:

The BLM should skew REDAs more toward Tiers 1 and 2 rather than Tier 3.

Response:

The BLM has incorporated the recommendation of our cooperating agency, AGFD, to use Species Habitat Conservation Guide tiers 4, 5, and 6 as REDA screens. Tiers 1, 2, and 3 are not used as REDA screens.

Comments:

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: Recommendation: BLM should work to ensure that the distribution of REDAs into Species and Habitat Conservation Guide tiers is skewed proportionally more towards Tiers 1 & 2 than Tier 3.

Sonoran Desert Heritage Conservation Proposal

Summary:

The BLM should include the Sonoran Desert Heritage Conservation Proposal as a screening criterion for REDAs.

Response:

The REDA screen recognizes officially designed special management areas, As the Sonoran Desert Heritage area is currently under consideration by Congress and has not yet been designated as a special management area, it was not included as an REDA screen. Should the Sonoran Desert Heritage area be designated by Congress as a special management area in the future, then it will be excluded from any renewable energy development as noted in national solar and wind energy policy.

Comments:

Submission No: RDEP-Drft-0065
Commenter: The Wilderness Society
Comment: First, the BLM should remove the few proposed sites that currently conflict with the Sonoran Desert Heritage conservation proposal.

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: Sonoran Desert Heritage conservation plan: These areas should be added as a screen. The Sonoran Desert Heritage conservation plan in western Maricopa County has been proceeding through a public process for several years. The project aims to gain federal designations of wilderness and National Conservation Area on over 600,000 acres of BLM lands. Currently, the REDA in the RDEP conflicts with up to 12,300 acres of land that is included in this proposal. Solar development is inappropriate in these areas, and we ask that the BLM add these lands as a screen. Figure 1 shows the boundaries of the proposal in a black line with areas in conflict in red. GIS data for this area is included in the enclosed CD, Attachment 1.

Submission No: RDEP-Drft-0025
Commenter: Christopher Lish
Comment: First, the BLM should remove the few proposed sites that currently conflict with the Sonoran Desert Heritage conservation proposal.

Submission No: RDEP-Drft-0031
Commenter: Kathy Lopez
Comment: Lands within the Sonoran Desert Heritage Proposal, which encompasses critical wildlands in western Maricopa County, should be removed from potential renewable energy development areas.

Submission No: RDEP-Drft-0036
Commenter: Tom Taylor
Comment: 2. pls consider the Sonoran desert heritage proposal and keeping it wildlife landscape.

Submission No: RDEP-Drft-0033
Commenter: Jeanie Watkins
Comment: Lands within the Sonoran Desert Heritage Proposal, which encompasses critical wildlands in western Maricopa County, should be removed from potential renewable energy development areas.

Specific Species of Concern

Summary:

The BLM should change the REDA model screens to individual species of concern so that high quality habitats are not missed.

Response:

The BLM used the AGFD Heritage Database Management System ESA listed species as well as individual sensitive species data as available from BLM, cooperating agencies, and public sources.

The AGFD State Habitat Conservation Guide (Species and Habitat Conservation Guide) does not predict species diversity; it is a statewide model of conservation potential and sensitive species are accounted for in the Species and Habitat Conservation Guide model. The Species and Habitat Conservation Guide has six tiers of conservation potential, with areas categorized as tier 6 having the highest conservation potential and areas of tier 1 having the lowest conservation potential. The AGFD used five indicators of wildlife conservation to make the Species and Habitat Conservation Guide model:

1. The importance of the landscape in maintaining biodiversity, represented by the species of greatest conservation need;

2. The economic importance of the landscape to the AGFD and the community, represented by the species of economic and recreational importance;
3. The economic importance of the water bodies and aquatic systems to the AGFD and the community, represented by sport fish;
4. Large areas of relatively intact habitats, represented by unfragmented areas; and,
5. The importance of riparian habitat to wildlife, represented by riparian habitat

As noted in the Final EIS, any proposal for a solar or wind development will require due diligence, such as compliance with NEPA, wildlife laws, regulations, and guidance. This could include conducting biological surveys of the development proposal and a full analysis of the impacts on any resources found in the area of potential effect Species and Habitat Conservation Guide before permitting.

The BLM and the AGFD agree that the AGFD predicted species raster datasets (AGFD 2012b) as unsuitable for REDA screens.

<u>Comments:</u>

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: The AGFD's Species and Habitat Conservation Guide model and BLM's Special Status Species layer are both composite datasets that comprise data from many species of conservation concern. While we support the use of these screens, their synthetic nature does not provide the public the ability to understand the potential impacts of the various alternatives upon specific species of conservation concern. In addition, it is our understanding that the Species and Habitat Conservation Guide predicts species diversity only. Thus, we are concerned that using only the top three tiers (with moderate to high diversity only) as a screen may overlook some important moderate to high quality habitats for individual species of conservation concern that should be screened out.

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: The AGFD's Species and Habitat Conservation Guide model and BLM's Special Status Species layer are both composite datasets that comprise data from many species of conservation concern. While we support the use of these screens, their synthetic nature does not provide the public the ability to understand the potential impacts of the various alternatives upon specific species of conservation concern. In addition, it is our understanding that the Species and Habitat Conservation Guide predicts species diversity only. Thus, we are concerned that using only the top three tiers (with moderate to high diversity only) as a screen

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: The BLM should incorporate AGFD spatial data for pronghorn in its analysis to identify key moderate to high quality habitat networks and migratory corridors for pronghorn. These areas should be screened out from consideration as REDAs, so as to avoid contributing to habitat loss, fragmentation, population isolation and associated population declines. In addition to utilizing AGFD data, the BLM should consider evaluating the class A and class A & D grasslands from The Nature Conservancy's grassland inventory as possible screens for REDAs, in order to avoid directing development to important habitats for pronghorn and other grassland obligates.

Wildlife

Summary:

The BLM should consult with the USFWS and AGFD for the best available information for additional wildlife screens, including pronghorn and habitats for the Sonoran desert tortoise, the shovel-nosed snake, the western burrowing owl, the banded Gila monster, and the Springerville pocket mouse.

Response:

As noted above, the BLM used the AGFD Heritage Database Management System for ESA listed species, individual sensitive species data as available from BLM, cooperating agency, and public sources, and the AGFD's Species and Habitat Conservation Guide model as wildlife screens in determining REDAs. The BLM and the AGFD agree that the AGFD predicted species raster datasets (AGFD 2012b) as unsuitable for REDA screens because it has not been validated using the heritage database system.

The BLM used data on special status species as areas eliminated from consideration. A majority of the big game density data recommended by AGFD for inclusion as REDA was incorporated as screens. Other big game species habitats with conflicts to REDAs will be evaluated on a site-specific basis.

The BLM will manage desert tortoise habitats in accordance with Instruction Memorandum No. AZ-2012-31. RDEP has eliminated from considerations desert tortoise categories 1, 2, and 3 and included the most recent data on desert tortoise conservation areas from the Solar Final EIS. Prior to any authorization, analysis for impacts to desert tortoise habitats on a site-specific basis will be required.

Pronghorn habitats occur in areas that are also suitable for renewable energy development, including an existing wind farm. The site-specific impacts analysis should include impacts to pronghorn habitats based on renewable technologies.

As noted in the Final EIS, any proposal for a solar or wind development will require due diligence, such as National Environmental Policy Act (NEPA) and wildlife policy compliance, including conducting a biological surveys of the development proposal and a full analysis of the impacts on any resources found in the area of potential effect before permitting.

Comments:

Submission No: RDEP-Drft-0052

Commenter: Ginger Ritter, Arizona Game and Fish Department

Comment: The Department was not consulted on how these layers should be applied. We recommend including the following:

a) Bighorn sheep- exclude all

* Bighorn are declining statewide due to drought, habitat fragmentation, and loss of habitat. It is crucial to protect/preserve all remaining suitable habitat that exists.

b) Black bear- exclude all.

* Excluding all does not affect BLM lands and does not remove a significant portion of the non BLM lands from the REDAs.

c) Elk (Summer)- no change

d) Elk (Winter)- also exclude very high

* Does not appear to have been excluded.

e) Javelina- also exclude low

* Excluding low removes an insignificant amount of BLM lands from the REDAs.

f) Mountain lion - no change) Mule deer (Summer)- also exclude medium

* Excluding medium removes an insignificant amount of BLM lands from the REDAs and would be

consistent with the exclusions places on their winter ranges.

g) Mule deer (Summer)- also exclude medium

* Excluding medium removes an insignificant amount of BLM lands from the REDAs and would be consistent with the exclusions places on their winter ranges.

h) Mule deer (Winter)- no change

i) Pronghorn (Summer)- exclude all but very sparse

* Pronghorn are declining statewide due to due to drought, habitat fragmentation, and loss of habitat. It is crucial to protect/preserve much of the remaining suitable habitat that exists.

j) Pronghorn (Winter)- exclude all

* See above

k) Turkey (Summer)- no change

1) Turkey (Winter)- no change

m) White-tailed deer- also exclude low

* Excluding low does not affect BLM lands and does not remove a significant portion of the non BLM lands from the REDAs.

Submission No: RDEP-Drft-0015

Commenter: Matt Clark, Defenders of Wildlife, Phoenix Meeting Transcript

Comment: In particular, I think there's concern with regard to intact native grasslands, which often occur, not surprisingly in flat sunny areas, and so wanting to make sure that we're prioritizing utility and subutility-scale development is not in our most intact, high-quality grasslands, and also related to that, to species that depend upon intact high-quality grasslands or grassland obligate species, including wide-ranging species like pronghorn. So I'm hoping that BLM and cooperating agencies can work to potentially address that through, you know, the possibility of screening out any crucial areas for species like pronghorn or important areas for landscape connectivity for those species.

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: The RDEP DEIS recognizes the ongoing threats and challenges to stabilizing and increasing American pronghorn numbers in Arizona: "Today, due to loss of habitat from housing development, fragmentation by highways, and other land use changes, populations have declined and are maintained by relocation programs." (DEIS p 3-40). Pronghorn are one of the AGFD's Species of Economic and Recreational Importance. Yet, the DEIS fails to quantify or qualify the potential impacts of the various alternatives upon this species of ecological, economic, and recreational importance. The DEIS also does not utilize American pronghorn habitat as a screen in its "important big game habitats", which we believe should be rectified. Because pronghorn habitats in Arizona are diverse across the state and have a patchy-distribution in many cases, due to intervening, and in some cases encroaching, woodlands or other physical and visual barriers – remaining connections between habitat patches of this animal (that is naturally averse to visual obstructions), may be narrow or already compromised in some way (e.g. by substandard fencing, encroaching vegetation, roads and other human developments), and thus may be easily severed or disrupted by large-scale renewable energy development projects. For these reasons, we encourage BLM to revisit utilizing American pronghorn as a screen at this statewide, programmatic level, in order to plan appropriately for the conservation and recovery of this iconic, wide-ranging grassland obligate species.

Submission No: RDEP-Drft-0006

Commenter: Alex Daue, The Wilderness Society

Comment: The BLM should incorporate AGFD spatial data for pronghorn in its analysis to identify key moderate to high quality habitat networks and migratory corridors for pronghorn. These areas should be screened out from consideration as REDAs, so as to avoid contributing to habitat loss, fragmentation, population isolation and associated population declines. In addition to utilizing AGFD data, the BLM should consider evaluating the class A and class A & D grasslands from The Nature Conservancy's grassland inventory as possible screens for REDAs, in order to avoid directing development to important habitats for pronghorn and other grassland obligates.

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: Special Status Species, Including T&E Species Locations – While we commend the BLM for attempting to screen out special status species habitat from further consideration as REDAs, it is clear from our preliminary review of spatial data obtained on 05/02/12 from AGFD that there is significant overlap between proposed REDAs of the various DEIS alternatives and AGFD predicted distributions for the Sonoran desert tortoise and other special status species. We recommend BLM revisit AGFD predicted distributions for all special status species, consult with the AGFD and USFWS, and identify all moderate to high quality habitats for special status species that should be screened, so as to avoid inclusion of lands in REDAs containing such conflicts.

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: We recognize that the BLM has attempted to screen out conflicts with this sensitive and declining species by utilizing its own spatial dataset of Sonoran desert tortoise management units as a screen. While we support the application of this screen, we also believe there are likely additional important Sonoran desert tortoise habitats, in particular those in flatter terrain in intervening valleys that, while more sparsely populated, are nonetheless key to maintaining intact habitat and areas that are free of human-created barriers, so as to maintain a functionally connected metapopulation. As described in the species account, core, higher density populations of this species tend to be "island like" and associated with steeper terrain and aspects. This description is consistent with the configuration of BLM's Sonoran desert management units that were used as an RDEP screen. The AGFD predicted distribution, however, predicts more of the flatter terrain that "may be important for longterm population viability". This flatter terrain is coincident with some of the lands also identified as having ideal solar resources and low slope. We are concerned with the large amount of acreage of AGFD predicted distribution that lies outside of the BLM's management units and screen.
Recommendation: In order for the RDEP program to avoid directing development into important Sonoran desert tortoise linkages and potentially contributing to the decline of this species, we recommend the BLM consult with the USFWS and AGFD to interpret the best available information, which should inform the Final RDEP DEIS REDA preferred alternative extent and configuration, such that all important low density, habitat connectivity and dispersal habitats for this species are identified and screened out of the final preferred alternative.

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: Analysis: According to analyses we performed with BLM and AGFD spatial data, RDEP DEIS Alternative 1 overlaps Tucson shovel-nosed snake predicted distribution by a total of approximately 81,432 acres (300 acres on BLM administered lands and 81,132 acres on non-BLM lands). According to the same data, RDEP DEIS Alternative 6 overlaps Tucson shovel-nosed snake predicted distribution by a total of approximately 80,210 acres (421 acres on BLM administered lands and 79,789 acres (See Appendix B).
Recommendation: We encourage the BLM to screen out all important habitats for the Tucson shovel-nosed snake. Habitat for this declining species is key to maintain intact and free of humancreated barriers, so as to maintain a healthy metapopulation. The flat terrain associated with suitable Tucson shovel-nosed snake habitat is coincident with some of the lands also identified as having ideal solar resources and low slope. In order for the RDEP program to avoid directing development into important Tucson shovel-nosed snake habitat and potentially contributing to the decline of this species, we recommend the BLM consult with the USFWS and AGFD to interpret the best available information, which should inform the Final RDEP DEIS REDA preferred alternative extent and configuration, such that all important habitat and areas of important

habitat connectivity for this species are identified and screened out of the final preferred alternative. "

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: Analysis: According to analyses we performed with BLM and AGFD spatial data, RDEP DEIS Alternative 1 overlaps Western burrowing owl predicted distribution by a total of approximately 336,108 (18,166 acres on BLM administered lands and 317,942 acres on non-BLM lands). According to the same data, RDEP DEIS Alternative 6 overlaps Western burrowing owl predicted distribution by a total of approximately 236,435 acres (13,937 acres on BLM administered lands and 222,498 acres (See Appendix B).
Recommendation: We encourage the BLM to screen out all important habitats for the Western burrowing owl, as well as habitats for associated burrowing mammals. The flat terrain associated with suitable Western burrowing owl habitat is coincident with some of the lands also identified as having ideal solar resources and low slope. In order for the RDEP program to avoid directing development into important Western burrowing owl habitat and potentially contributing to the decline of this species, we recommend the BLM consult with the USFWS and AGFD to interpret the best available information, which should inform the Final RDEP DEIS REDA preferred alternative extent and configuration, such that all important habitat and areas for this species are identified and screened out of the final preferred alternative.

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: "Analysis: According to analyses we performed with BLM and AGFD spatial data, RDEP DEIS Alternative 1 overlaps the broader Gila monster predicted distribution by a total of approximately 1,091,236 acres (226,052 acres on BLM administered lands and 865184 acres on non-BLM lands). According to the same data, RDEP DEIS Alternative 6 also overlaps Gila monster predicted distribution by a total of approximately 1,092,236 acres (226,052 acres on BLM administered lands and 865,184 acres (See Appendix B).
Recommendation: We encourage the BLM to screen out all important habitats for the Banded Gila monster. We recognize that the analysis conducted above is for the species as a whole, and only a portion of this analysis applies to the Banded Gila monster. However, the spatial data layer provided does not break out the Banded Gila monster from the predicted distribution at the species level. In order for the RDEP program to avoid directing development into important Banded Gila monster habitat and potentially contributing to the decline of this species, we recommend the BLM consult with the USFWS and AGFD to interpret the best available information, which should inform the Final RDEP DEIS REDA preferred alternative extent and configuration, such that all important habitat and areas of important habitat connectivity for this species are identified and screened out of the final preferred alternative. "

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: According to analyses we performed with BLM and AGFD spatial data, RDEP DEIS Alternative 1 overlaps the predicted distribution of the Springerville pocket mouse by a total of approximately 88,063 acres (4,711 acres on BLM administered lands and 83,352 acres on non-BLM lands). According to the same data, RDEP DEIS Alternative 6 also overlaps Springerville pocket mouse predicted distribution by a total of approximately 60,688 acres (1,140 on BLM administered lands and 59,248 acres on non-BLM lands) (See Appendix B). Recommendation: We encourage the BLM to screen out all important habitats for the Springerville pocket mouse. In order for the RDEP program to avoid directing development into important Springerville pocket mouse habitat and potentially contributing to the decline of this species, we recommend the BLM consult with the USFWS and AGFD to interpret the best available information, which should inform the

Final RDEP DEIS REDA preferred alternative extent and configuration, such that all important habitat and areas of important habitat connectivity for this species are identified and screened out of the final preferred alternative.

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: Through our analysis of the proposed nominated sites, REDAs and Agua Caliente Solar Energy Zone, it has become apparent that significant portions of these lands may not qualify as lands of "low resource sensitivity" because of potentially significant conflicts with habitats for special status species and species of economic and recreational importance. Therefore, while we cannot support any of the alternatives as currently proposed, we hope to be able to support a modified alternative that does adequately screen out these habitats from these areas. In order to achieve this, we recommend the BLM consult closely with the AGFD, the US Fish and Wildlife Service, and wildlife experts from the academic and non-profit sectors, so as to ensure the areas identified do meet the BLM's definition of "low resource sensitivity.

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: Special Status Species, Including Threatened and Endangered Species Locations – While we commend the BLM for attempting to screen out special status species habitat from further consideration as REDAs, it is clear from our preliminary review of spatial data obtained on 05/02/12 from AGFD that there is significant overlap between proposed REDAs of the various DEIS alternatives and AGFD predicted distributions for the Sonoran desert tortoise and other special status species. We recommend BLM revisit AGFD predicted distributions for all special status species, consult with the AGFD and USFWS, and identify all moderate to high quality habitats for special status species that should be screened, so as to avoid inclusion of lands in REDAs containing such conflicts.

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: The BLM should incorporate AGFD spatial data for pronghorn in its analysis to identify key moderate to high quality habitat networks and migratory corridors for pronghorn. These areas should be screened out from consideration as REDAs, so as to avoid contributing to habitat loss, fragmentation, population isolation and associated population declines. In addition to utilizing AGFD data, the BLM should consider evaluating the class A and class A & D grasslands from The Nature Conservancy's grassland inventory as possible screens for REDAs, in order to avoid directing development to important habitats for pronghorn and other grassland obligates.

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: Overall, we strongly recommend that the BLM consult closely with the Arizona Game and Fish Department and the USFWS to identify all special status species and big game habitats, as well as areas important for habitat connectivity of same, that should be screened out in the creation of a new, truly low-conflict alternative for the Final EIS. Our primary goal is to strengthen what we believe is a very promising approach to the development of renewable resources.

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: (1) as detailed in our joint letter with the Arizona Solar Working Group, the Species and Habitat Conservation Guide model mainly identifies areas of high species diversity, but some important special status species (e.g. Sonoran desert tortoise) may exist in habitats of relatively low diversity and thus additional careful screening is necessary to screen out their habitats

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: While we agree that the RDEP screening process holds the potential to identify a subset of low resource sensitivity lands, Defenders' preliminary analyses of the overlay between proposed REDAs in Alternatives 1 and 6 and spatial data from the AGFD's Statewide Wildlife Action Plan and HabiMap have illuminated significant potential conflicts with special status species, as well as species of economic and recreational importance. Therefore, we do not believe any of the currently proposed DEIS alternatives are consistent with RDEP's intent and we therefore unable to support any of the proposed alternatives. BLM should include a modified preferred alternative in the Final DEIS that has adequately screened out these important wildlife habitats.

Yuma Proving Ground

Summary:

The BLM should include a 10-mile buffer along the YPG boundary and US-95 through the YPG as additional elimination criteria.

Response:

In review of comments, the BLM eliminated the small REDA inholdings within the YPG boundary, but did not apply a 10-mile buffer along the southeast/east YPG boundary.

The RDEP identifies lands across Arizona that are most suitable for the development of renewable energy. This proposed land use allocation is at the planning-level scale and would not authorize any specific projects or imply such approval. Any proposal for a wind or solar energy project will still require site specific permitting, additional environmental analysis, and NEPA compliance. Different renewable energy technologies have different impacts; therefore, during this process, the BLM would coordinate with the DOD to avoid any impacts to the military mission.

Comments:

Submission No: RDEP-Drft-0030
Commenter: Matthew D Williamson CIV, US Army Garrison Yuma
Comment: YPG Eastern Boundary Comments: Request a 10-Mile buffer along southeast/east YPG boundary, as solar panels within this area would interfere with ongoing testing.

Submission No: RDEP-Drft-0030
Commenter: Matthew D Williamson CIV, US Army Garrison Yuma
Comment: US-95 Corridor Within YPG Comments: Non-concur, solar panels in this area would interfere with ongoing testing.

Land Tenure

Summary:

The description of the Land Tenure Alternative is confusing, and the BLM should clarify its purpose and policies.

Response:

The goals, objectives, and management actions Land Tenure Alternative are described in Section 2.3.2, Elements Common to All Action Alternatives (pg. 2-12 to 2-13 in the Draft EIS), and were developed to respond to key planning issue #6, Land Tenure Adjustments: Can the BLM exchange or sell disposal parcels in order to benefit local economies and create development incentives? (See Section 1.10, Key Planning Issues, pg. 1-21 of the Draft EIS.) The Land Tenure goal was put forward to address both of

these points by allowing the BLM to pursue disposal of its available land in the REDA and the acquisition of non-federal lands in areas of high conservation priority (pg. 2-12, Draft EIS). The description in the Final EIS has been improved to provide this clarity on the purpose of the alternative and why it is under consideration.

Comments:

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: We recommend that the EIS explicitly recognize the challenges with exchanges and seek to utilize them on a limited basis as they will add to the complexity and possible controversy of a proposed renewable energy development.

Submission No: RDEP-Drft-0056
Commenter: Katherine Rose and Audrey Werth
Comment: It should be noted that certain areas of the EIS statement were vague and used unclear wording. In the proposed land tenure REDA the rhetoric was especially convoluted. Also enough reasoning was not provided as to why land owners would benefit from trading "conservation" land with "disposed of" lands. A clarification of this section of the impact statement would allow for a better understanding of all of the alternatives.

Load Centers

Summary:

The lands where the CAP load center overlaps with other sensitive lands, such as wilderness areas and National Wildlife refuges, should be removed from consideration as REDAs.

Response:

The BLM reviewed the GIS data and REDA screens to determine if there were conflicts between load centers and sensitive resource areas. The review found that in areas where the load center criteria overlaps with a wilderness or wildlife refuge, those areas are still eliminated from consideration from REDA and are not included in Alternative 1, Maximum REDA.

Comments:

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: The 5-mile screen in Alternative 3 is appropriate if the RDEP's focus is placed on previously disturbed lands and pumping stations along CAP for any potential renewable energy project. Examples of potentially sensitive areas to avoid include lands south of the Bill Williams River National Wildlife Refuge where the canal emerges from under the Bill Williams Mountains, the East Cactus Plain Wilderness Area located near Bouse, and some sections near the Harquahala Mountains

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: The 5-mile screen in Alternative 3 is appropriate if the RDEP's focus is placed on previously disturbed lands and pumping stations along CAP for any potential renewable energy project. Examples of potentially sensitive areas to avoid include lands south of the Bill Williams River National Wildlife Refuge where the canal emerges from under the Bill Williams Mountains, the East Cactus Plain Wilderness Area located near Bouse, and some sections near the Harquahala Mountains.

New Alternative

Summary:

The commenter suggests a new alternative that would consider only lands marked for disposal that are also no longer suitable wildlife habitat and that have no cultural resources.

Response:

The BLM reviewed the merits of this suggestion and determined that it would leave REDA lands too small and fragmented and would not meet the purpose and need of the RDEP. The Final EIS was updated to explain that this alternative was considered but eliminated from detailed analysis (see Section 2.5, Alternatives Considered but Eliminated from Detailed Analysis).

Comments:

Submission No: RDEP-Drft-0056

Commenter: Katherine Rose and Audrey Werth

Comment: We propose a seventh alternative in which the land used would only be disposed lands that are no longer acceptable for wildlife habitat and do not have any cultural significance. There would be no problem with developing in these areas.

Policy

Summary:

The RDEP should have specific guidelines for NEPA analysis that would be required within REDAs.

Response:

As described in the Final EIS Section 1.5.3, Requirements for Further Environmental Analysis, any proposal submitted to BLM for a solar or wind development will require due diligence, including National Environmental Policy Act (NEPA) compliance; environmental reviews for projects submitted after the RDEP Record of Decision is signed would be tiered to the RDEP EIS and would follow all current CEQ and BLM NEPA requirements, policies, and guidance. Additionally, the BLM retains the discretion to deny solar and wind ROW applications based on site-specific issues and concerns, even in those areas available or open for application in the existing land use plan.

Comments:

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: The Final EIS should provide guidance on issues to be developed in NEPA analysis for specific solar applications within a REDA, whether in an EA or EIS, including:

Specifying that robust public involvement is required, including requiring a comment period, even if using an EA, and emphasizing the benefits of early and ongoing public involvement, such as through providing preliminary alternatives for public comment;

Requiring cumulative impact analysis to address ongoing projects and stressors in the project area that cannot be accomplished through tiering; and

Clarifying BLM's authority to deny applications. We support the BLM reiterating that the agency "retains the discretion to deny solar and wind ROW applications based on site-specific issues and concerns, even in those areas available or open for application in the existing land use plan" (DEIS, p. ES-7). We would also recommend that the BLM clarify that its discretion can be applied to deny applications without conducting in-depth environmental analysis.

Required Plans – Transportation

Summary:

The BLM should add that the proponent shall address local government planning requirements as part of the transportation-related required plans.

Response:

The RDEP identifies lands across Arizona that are most suitable for the development of renewable energy. The proposed land use allocations are at the planning-level scale and would not authorize any specific projects or imply such approval. Any proposal for a wind or solar energy project will still require site specific permitting, additional environmental analysis, and NEPA compliance. Local coordination would occur as part of the site-specific permitting, including an analysis of impacts on transportation systems. The Final EIS includes a variety of design features that provide opportunities for local government involvement and consultation, such as:

- Make early contact with local officials, regulators, and inspectors to explore all applicable regulations and address concerns unique to solar power generation projects.
- Emphasize early identification of, and communication and coordination with local agencies, elected officials, and concerned citizens.
- Consult with local agencies about potential impacts of development in or close to state or local special use areas, such as parks.
- Avoid lands identified as incompatible by local governments for renewable energy development.
- Site facilities to maximize local, regional, and statewide economic benefits and coordinate with local and state entities, such as state and county commissions and planning departments.
- Site projects to minimize adverse effects on area housing markets and local infrastructure (e.g., schools and other public services) and to ensure adequate housing vacancy rates and local infrastructure support for workers and their families (Solar Final PEIS, Volume 7, pg. 48).

Comments:

Submission No: RDEP-Drft-0043

Commenter: Karl Taylor, Mohave County Public Works

Comment: Table B-2: An access road siting and management plan shall in addition address local government planning requirements. Planning requirements may include completion of a Traffic Impact Analysis to identify and properly plan road infrastructure necessary to provide construction and post-construction access to the developed site as well as provide information and data on traffic load (volume and vehicle class/weight) for evaluation of impacts and mitigation requirements on existing local government unpaved and paved roads serving the development.

Submission No: RDEP-Drft-0043

Commenter: Karl Taylor, Mohave County Public Works

Comment: Table B-2: Traffic Management Plan - The reference to Traffic Management Plan is too broad in nature and should be expressed under local government planning and operations requirements. Planning requirements may include completion of a Traffic Impact Analysis to identify and properly plan road infrastructure necessary to provide construction and post-construction access to the developed site as well as provide information and data on traffic load (volume and vehicle class/weight) for evaluation of impacts and mitigation requirements on existing local government unpaved and paved roads serving the development. Operations requirements involve obtaining all required State and local government right-of-way use and oversize/overweight vehicle permits

pertinent to site construction work and routine operations.
Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: Table B-2: Access Road Siting and Management Plan - An access road siting and management plan shall in addition address local government planning requirements. Planning requirements may include completion of a Traffic Impact Analysis to identify and properly plan road infrastructure necessary to provide construction and post-construction access to the developed site as well as provide information and data on traffic load (volume and vehicle class/weight) for evaluation of impacts and mitigation requirements on existing local government unpaved and paved roads serving the development.

Submission # RDEP-Drft-0043
Commenter: Karl Taylor, Mohave County Public Works
Comment: Table B-2: Traffic Management Plan - The reference to Traffic Management Plan is too broad in nature and should be expressed under local government planning and operations requirements. Planning requirements may include completion of a Traffic Impact Analysis to identify and properly plan road infrastructure necessary to provide construction and post-construction access to the developed site as well as provide information and data on traffic load (volume and vehicle class/weight) for evaluation of impacts and mitigation requirements on existing local government unpaved and paved roads serving the development. Operations requirements involve obtaining all required State and local government right-of-way use and oversize/overweight vehicle permits pertinent to site construction work and routine operations.

Required Plans – Water Resources

Summary:

The BLM should include a provision for the proponent to prepare the Water Resource Plan in consultation with ADWR.

Response:

The water policy of the BLM is that the states have the primary authority and responsibility for the allocation and management of water resources within their own boundaries, except as otherwise specified by Congress. The BLM will cooperate with state governments, including the Arizona Department of Water Resources, under the umbrella of state law to protect all water uses identified for public land management purposes and will conform to applicable state water laws and administrative claims procedures in managing and administering all BLM programs and projects, except as otherwise specifically mandated by Congress.

Appendix B, Design Features, Required Plans, and Best Management Practices details a number of actions and plans a proponent must take including the following:

- ***Required plans:*** Water Resources Monitoring & Mitigation Plan, detailed hydrologic study, and comprehensive groundwater basin analysis
- Make early contact with local officials, regulators, and inspectors to explore all applicable regulations and address concerns unique to solar power generation projects.
- Emphasize early identification of, and communication and coordination with stakeholders, including state and local agencies (including ADWR), elected officials, and concerned citizens.
- Consult with local agencies about potential impacts of development in or close to state or local special use areas, such as parks.

- Avoid lands identified as incompatible by local governments for renewable energy development.
- Compare preliminary site grading, drainage, erosion, and sediment control plans with applicable local jurisdiction requirements.
- Consult state and local "waterwise" guidelines, as applicable, for project development in the arid Southwest.

Comments:

Submission No: RDEP-Drft-0001
Commenter: Michael J. Lacey, Arizona Division of Water Resources
Comment: Water Resource Monitoring & Mitigation Plan, Table B-2, Page B-46. ADWR recommends that such plans are required to be prepared in consultation with the Department and local water providers and water users.

Submission No: RDEP-Drft-0001
Commenter: Michael J. Lacey, Arizona Division of Water Resources
Comment: Table B-3, Required Studies, Pages B-49 and B-50. ADWR suggests segregating the flood control and water supply elements.

Submission No: RDEP-Drft-0001
Commenter: Michael J. Lacey, Arizona Division of Water Resources
Comment: Additionally, we recommend tailoring the required groundwater studies to the proposed use. A prospective wet-cooled CSP facility utilizing several thousand acre-feet of groundwater per year should be required to conduct a far more robust investigation and impact evaluation than a PV facility using 20 acre-feet for panel cleaning and domestic use. ADWR recommends modification of the bullet at the top of Page B-50 to "…other water users and water right claimants…"

Transmission – Change Screening Criteria

Summary:

The BLM should modify the Alternative 2 Transmission Line and Utility Corridor screening criteria to include lower voltage restrictions, remove the length of transmission criterion, and should include a capacity criterion or criteria.

Response:

It is important to recognize that the REDAs are identified for *potential* development based on an analysis of environmental constraints. Any proposal for an actual project would require due diligence on the part of the project proponent, including determination of line capacity and length of transmission required for the type of development and its location. Effects resulting from a specific project, its location, and design elements would be analyzed and disclosed during the NEPA compliance process.

The identification of a REDA near transmission does not imply capacity. Conversely, by not using capacity as a screen, REDAs are not eliminated where capacity might be an issue today, but alleviated in the future.

The areas within five-miles of transmission line or utility corridor used for Alternative 2 were developed based on conversations with industry and utility companies. While the economically viable length of any gen-tie is dependent on the specifics of a project, five miles was a number that consistently came up as being financially reasonable while minimizing resource conflicts. Larger BLM REDAs contiguous with areas within five miles of existing or planned transmission lines were also included. Additionally, the Load Alternative (Alternative 3) captures many of the lower voltage lines of concern.

As discussed in Draft EIS Section 2.5, Alternatives Considered but Eliminated from Detailed Analysis, the BLM considered a 20-mile zone around 230kV transmission lines. As mapped, this area captures most lower voltage lines and serves as an example of what would happen if lower voltage was included in the screen. Using a 20-mile zone, the results indicated that there would be no substantial difference in REDA acreage between a 20-mile transmission buffer and the Maximum REDA under Alternative 1.

Comments:

Submission No: RDEP-Drft-0003

Commenter: Amanda Ormond, Interwest Energy Alliance

Comment: Recommendation 1 – Transmission Voltage Restriction

In section 2.3.4 - Alternative 2 - BLM screens for lands that are within 5 miles of existing and planned transmission lines and further stipulated that the lines must be 230 kilovolt or higher. As RDEP is focused on supporting development of many technologies at various scales it is inappropriate to apply a screen of high voltage transmission as renewable energy projects can and commonly do connect to transmission lines of much lower voltage. As a general rule the higher the voltage of the interconnection the greater the cost of interconnection. If BLM maintains this voltage screen it will dissuade and make more expensive, smaller projects on BLM lands. Interwest recommends that no screen for voltage level be applied in any alternative.

Submission No: RDEP-Drft-0003

Commenter: Amanda Ormond, Interwest Energy Alliance

Comment: Recommendation 2 – Proximity to Transmission

In Alternatives 2 and 6 lands that are greater than five miles from existing and planned transmission are screened out (for the purpose of REDA designation). Wind and some solar projects may require longer than a five mile gen-tie line to connect to transmission to move power to market. BLM has not given a specific reason that five miles was chosen; this length seems arbitrary. Arizona's two existing wind projects have gen-tie lines of longer than five miles, demonstrating the need for review of this criteria.

Interwest recognizes that the Department is trying to add a reasonable filter to encourage the siting of projects near existing infrastructure, and that an underlying goal is protection of ecosystems and important habitat areas. However, the fact that there is a transmission line in the area of project development is not as important as if there is capacity (space) on the transmission line to carry the energy produced by the project. Interwest does not know of a way to use capacity on a transmission line as a screening criterion; as capacity values constantly change and are not publicly known. We believe that transmission proximity does not provide a reasonable proxy for habitat protection, and that the cost of transmission will naturally limit the geography of projects as projects that are near transmission as more economical.

Interwest recommends that the BLM not apply a screen of any length for transmission whether to an existing or planned transmission line or to BLM-designated utility corridors. Further, we believe BLM should explore alternate screening methodologies that would minimize habitat fragmentation."

Submission No: RDEP-Drft-0005

Commenter: Katherine Gensler, Solar Energy Industries Association

Comment: However, RDEP does not address the primary challenges to solar development in Arizona. In order for a solar power plant to be commercially viable and financeable, a developer must locate a site with plentiful solar resource, access to transmission and secure a long-term power purchase agreement from a utility. Arizona's solar resources are the envy of the Southwest. Like much of the West, though, transmission capacity available to transmit electricity from a new power plant is at a premium. As discussed below, BLM's analysis fails to properly

account for the transmission necessary to supply solar power both in-state and out-of-state.

Submission No: RDEP-Drft-0005
Commenter: Katherine Gensler, Solar Energy Industries Association
Comment: First, BLM incorrectly assumes that the existence of a transmission line is indicative of enough available transmission capacity to effectively transport power from the generating location to a load center. One can only know how much capacity is available after conducting a power flow model and contingency analysis. These analyses are complex and resource-intensive and are best undertaken by the responsible transmission planning entities. In addition, the "queue" for use of any available transmission may be crowded with requests for service for other projects, thus providing little or no assurance that any transmission capacity will be available for an additional project.

Submission No: RDEP-Drft-0005
Commenter: Katherine Gensler, Solar Energy Industries Association
Comment: Second, minimizing the distance between generation and the nearest transmission line does not assure the least environmental impact. The transmission grid is a vast, integrated network. Adding power to one spot on the transmission grid will cause impacts elsewhere on the system. It is not uncommon for a developer to learn that interconnecting to a particular substation ten miles away will cause fewer grid impacts – and fewer environmental impacts – than interconnecting to a substation only four miles away.
Again, this information can only be known as a result of the system impact study. If BLM insists upon an arbitrary standard of less than five miles to transmission, the result will be suboptimal development of both solar generation resources and transmission infrastructure. "

Submission No: RDEP-Drft-0005
Commenter: Katherine Gensler, Solar Energy Industries Association
Comment: Finally, while limiting the analysis to transmission lines 230 kV and above may be acceptable when contemplating utility-scale solar development. However, RDEP seeks to attract projects of less than 20 MW, as well, which could interconnect to transmission or distribution facilities at a much lower voltage level.

Submission No: RDEP-Drft-0005
Commenter: Katherine Gensler, Solar Energy Industries Association
Comment: The Arizona Solar Working Group is proposing further conversation about transmission and SEIA looks forward to those recommendations. At a minimum, in the Final EIS BLM should eliminate the 230 kV threshold and the requirement that a REDA be no more than five miles from an existing transmission line.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Recommendation: Given this insight regarding solar project viability at multiple voltage classes, ASWG recommends that the Preferred Alternative be modified such that the voltage class restriction of 230 kV or higher be removed.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Because power lines at voltages below 230 kV are much more ubiquitous throughout Arizona, proposed solar projects can be located nearer to lower voltage distribution and sub-transmission systems. The energy output of projects in the range of 10-100 MW can be accommodated on power lines at voltages much lower than 230 kV. In Arizona, typical voltages for different classes of power delivery are:

- Distribution level: 12.47 kV, 20.8 kV
- Sub-transmission level: 34.5 kV, 46 kV, and 69 kV
- High Voltage Transmission: 115 kV, 138 kV, 230 kV

- Extra High Voltage Transmission: 345 kV and 500 kV

The amount of interconnection capacity and typical lengths of power lines in each class increases with voltage, as shown in the table below. Power lines in the 46 kV voltage class in particular are often located in rural/remote areas of Arizona, which tend to coincide with many proposed REDAs, both on BLM and non-BLM-administered lands, making them ideal for renewable energy delivery to rural load centers. Similarly, 115 kV sub-transmission lines, which are capable of carrying the output of up to a 100-150 MW power plant tend to be located in both rural and surrounding metropolitan areas, making them ideal for delivery to both rural and urban load centers.

Voltage Interconnection Capacity Radial Distance

- 12 kV – 20.8 kV 1 - 10 MW 1 – 3 miles
- 34.5 kV – 46 kV 10 – 50 MW 3 – 10 miles
- 69 kV 50 – 100 MW 5 – 20 miles
- 115 kV / 138 kV 100 – 250 MW 20 – 40 miles
- 230 kV 250 – 500 MW 20 – 60 miles
- 345 kV / 500 kV 500 – 1,200 MW 50 – 100+ miles

The reason for variation, or ranges, of interconnection capacity in the above table, relates to variability in the design configurations of the power lines considered here. In essence, not all power lines of a given voltage class are "created equal." The interconnection capacity considered in this table contemplates a typical amount of power that may be added to an existing line. However, factors such as the "youth" or age and saturation of a line, the design ampacity (capacity for power flow), the configuration of a line that may comprise multiple (bundled) conductors, and other factors affecting the power flow capacity of any given line will vary.

Water – Screening Criteria

Summary:

The BLM should consider different screening criteria, such as availability of renewable water supplies and access to water delivery infrastructure.

Response:

The overall purpose the RDEP is to identify those areas best suited for renewable energy development. In order to find the best suited areas, BLM consulted with ADWR to find a way to use additional protection measures that would highlight areas that may have sensitive water use issues. The Water Protection Zones purpose was not to exclude or eliminate areas from REDA, but to require additional design features that developers would need to consider when siting, designing, constructing, and operating renewable energy projects. The Zones are arranged hierarchically, with WPZs 2 and 3 adding increasingly strict design features in addition to those defined in Appendix B, Design Features, such as annual consumption of a renewable energy development would not exceed 55 acre-feet per year (WPZ 3 design feature). Water Protection Zone 1 offers a minimum set of water quantity protection (only the design features noted in Appendix B, Design Features) and are based on the relative abundance of groundwater. Because some groundwater basins have very little published groundwater data, a determination could not be made as to its current condition. Those groundwater basins where the condition could not be determined were placed into WPZ 1 to ensure that they would have at least the minimum protection, pending receipt of additional data.

Should a project be proposed, effects on water quantity and quality will be evaluated on all proposed facilities on BLM-administered lands regardless of the Water Protection Zone, and BLM would require the project to meet all required and applicable mitigation measures, design features, and BMPs.

Comments:

Submission No: RDEP-Drft-0001

Commenter: Michael J. Lacey, Arizona Division of Water Resources

Comment: "The zones appear to have been established without regard to availability of renewable water supplies and access to water delivery infrastructure.

BLM reaches the conclusion that all lands within AMAs may not serve as appropriate locations for utility-scale solar facilities. While the AMAs were created in response to concerns about water level declines, significant progress has been made since the passage of the Groundwater Management Act (GMA) in 1980. By example, portions of the Phoenix AMA are blessed with sustainable, adequate, and redundant water supplies and, as such, may be suitable for utility-scale solar facilities, including concentrating solar power (CSP) facilities. Such facilities would need to secure water rights or withdrawal authorities from ADWR and would be subject to conservation requirements established by the Department within its Management Plans. Alternatively, facilities developed outside of an AMA will conduct their business largely absent of any oversight by ADWR. They will have no State-mandated water conservation requirements, nor will they have to meter or report their water use.

Zone 1 as presented on Figure 2-9 appears to be the “catch all” category, determined as those lands that do not fall into Zones 2 or 3. As mapped, Zone 1 contains lands with limited or extremely challenging access to groundwater (the Central Highlands and Colorado Plateau, by example) and areas that are subject to the Colorado River Accounting Surface, requiring an allocation of Colorado River water for legal use.

While such groupings are attractive when assembling ambitious and comprehensive reports such as this Draft EIS, ADWR does not believe that these WPZs are especially useful for prospective developers of utility-scale solar facilities as presented. 2 Water withdrawn from wells located within the Colorado River Accounting Surface is administered by the US Bureau of Reclamation. The drilling of such wells is conducted under the purview of ADWR."

Water – Zone classification

Summary

The BLM needs to modify the water alternative screening criteria to include a criterion that would limit solar development technology within the REDAs based on the technology’s water consumption rates and the water classification system used in the water alternative, and it would integrate Arizona’s Water Development Commission study for identifying groundwater basins.

Response

The RDEP’s development of Water Protection Zones and applicable design features provide the mechanism for addressing water issues specific to a particular solar project’s design elements. Recognizing that renewable energy technologies are rapidly changing, in the water resource section the BLM chose to focus on water use and availability rather than on a specific technology. As an example and in most cases, a PV facility could be located anywhere, based on available water resources and assuming all other conditions were met. A CSP facility could also be located anywhere, but it could have the greatest chance of becoming operational in WPZ 2 or WPZ 1 dependent upon the proposed cooling technology and whether the water is obtained from new or existing infrastructure.

While data used in development of the Water Protection Zones reflects current conditions as provided in the Water Development Commission study, the criteria (and associated design features) would apply to any basin from which conditions changes. In other words, it is possible for a basin that’s currently in WPZ 3 to be moved into WPZ 2 or WPZ 1 should conditions change within that basin.

Comments:

Submission No: RDEP-Drft-0058

Commenter: Buster Johnson, Mohave County Board of Supervisors

Comment: Why are certain water basins identified as needing "high" protection, versus "low" protection? How was this derived? Hualapai Basin, within Mohave County, is shown as a basin of apparent special concern, termed "high protection". There are other basins in the County listed as being of intermediate "protection".

Submission No: RDEP-Drft-0009

Commenter: Rob Marshall, MFS, The Nature Conservancy

Comment: 2) Integrate results of Arizona's Water Development Resources Commission study in the identification of water protection categories for Arizona's groundwater basins

The Conservancy commends BLM's designation of water basins with sensitive surface watersheds and known water supply issues with the highest level of water protection in the RDEP. BLM did not take into account the findings of a recent comprehensive report completed by Water Resource Development Commission that analyzed Arizona's water needs for the next 100 years and identified areas of the state that will require additional water supplies to meet future projected water demands (WRDC 2011). Analysis of those data indicate that several additional basins warrant classification as water protection zone 3, including:

(1) basins where projected future water demands will exceed supply within the next 25 and 50 years in those basins (Table 2a); and

(2) basins where surface water resources (perennial rivers and streams) are dependent upon and sensitive to changes in groundwater levels (Table 2b)."

Submission No: RDEP-Drft-0008

Commenter: Paul Melcher, Department of Development Services

Comment: In relation to the solar technology utilized, staff recommends that it be limited to photovoltaic (PV) or concentrated photovoltaic (CPV) applications for two reasons. First, there is a minimal amount of water needed for PV /CPV development, whereas concentrated solar projects (CSP) can be very water-intensive. Recognizing that molten salt or another liquid could be used for collection or transfer, water is still need to create the steam to tum the turbines as part of the conversion of heat to electricity. Moreover, there is a recognition by Arizona and Yuma County residents as captured in the repo11 from the 99111 Arizona Town Hall (November 2011) that the state must develop sustainable renewable energy resources that are less water intensive. From the Yuma County work group commenting on the town hall results, the participants expressed a common sentiment that decried the use of Arizona water and land assets to generate electricity for California. Further deference to PV /CPV projects is also supported by the EIS recognition that the Agua Caliente SEZ would fall into Water Protection Zone 2 (WPZ 2) under Table 2-6 of Alterative 4. WPZ 2 language contains specific groundwater protections based on natural recharge and a project design feature that limits water use to dry-cooling technology.

Submission No: RDEP-Drft-0001

Commenter: Michael J. Lacey, Arizona Division of Water Resources

Comment: The report did not sufficiently contrast the considerable differences in water use between CSP and Photovoltaic (PV) facilities. Based on ADWR's experience in siting solar facilities, water use between these competing technologies can be vastly different, with CSP consuming upwards of 100 times more water than comparably sized PV facilities.

The Department recommends that separate presentations be made delineating lands suitable for CSP and those suitable for PV, based on water as a siting constraint.

Climate Change – Impact Analysis

Summary:

The BLM needs to consider climate change impacts in RDEP's impact analysis.

Response:

The Draft EIS provided a discussion of the climate change environmental consequences of the No Action and action alternatives (Draft EIS, Section 4.2.2, Greenhouse Gas Emissions and Climate Change, pgs. 4-16 to 4-18). Programmatic-level analyses on plan-level actions, such as RDEP, are typically broad and qualitative, rather than being quantitative or focused on site-specific actions (BLM Land Use Planning Handbook H-1601-1, Chapter II, A-B at 11-13 and Chapter IV, B at 29).

Comments:

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: The BLM should address the issues associated with climate change and implications for water resources, wildlife and their habitats in the context of the solar energy development.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: The BLM should address the issues associated with climate change and implications for water resources, wildlife and their habitats in the context of the solar energy development.

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: The BLM should address the issues associated with climate change and implications for water resources, wildlife and their habitats in the context of the solar energy development.

1

G.2.3 Cultural Resources

Design Features and Best Management Practices

Summary:

The BLM should consider additional design features and BMPs that address cultural resources and tribal concerns, including supporting avoidance as the preferred mitigation measure and the one to be used in virtually all circumstances if cultural resources could be impacted.

Response:

Due to the statewide scale of RDEP and the extensive presence of cultural resources throughout the state, it is impractical for Class III surveys or individual ethnographic reports to be conducted. As noted above, the REDAs identified in alternatives are being considered for *potential* development; "RDEP will identify those areas most suitable for renewable energy development within the variance areas identified by the Solar PEIS" (Draft EIS, pg. ES-3). The BLM is not directing development to one area or another and neither will the Record of Decision result in the granting of a permit for a renewable energy development to start construction. Any proposal for a solar or wind development will require due diligence, including National Environmental Policy Act (NEPA) and cultural resource program policy compliance, such as conducting a Class III inventory of the development proposal and a full analysis of the impacts on any resources in the area of potential effect.

Regarding future applications, government-to-government and project-specific consultations with tribal staff will provide opportunities for tribes to identify traditional cultural properties or use areas, culturally important plant and animal species, continued access, or other concerns. However, there may be times when the specifics of the project and/or location will require new or additional ethnographic research to adequately consider the effects of the development. Should new ethnographic research, studies, or interviews be determined as necessary, the BLM cultural staff, in consultation with tribal officials, will develop an appropriate study scope to complete the affects analysis.

The RDEP has revised its design features, BMPs, and required plans and studies to be consistent with the design features in the Solar Final PEIS. Inclusion of relevant design features as part of a projects application to BLM is a required element of the RDEP, including avoidance as the preferred mitigation option. Other design features, such as required monitoring, would be included depending on the specific design and location of the proposal and would be decided on in consultation with the affected tribes and the State Historic Preservation Office. Additionally, the BLM retains the discretion to deny solar and wind ROW applications based on site-specific issues and concerns, even in those areas available or open for application in the existing land use plan.

The lead agency will prepare a Monitoring and Discovery Plan for each project, regardless of the presence or absence of documented cultural resources, to address any anticipated or unanticipated discoveries during construction and operations. This plan will include a Plan of Action to address any discoveries of human remains or materials protected under the Native American Graves Protection and Repatriation Act (NAGPRA). Such plans will be prepared and implemented in consultation with tribes. In the event of a discovery, tribes will be notified promptly in accordance with procedures defined in 36 CFR 800.13, *Post-review discoveries* or as specified in the regulations implementing NAGPRA. Tribes will be consulted in evaluating the discovery and determining appropriate treatment. If the BLM determines that avoidance is not feasible, after consulting with tribes, it will provide the tribes with its rationale for arriving at this decision.

<u>Comments:</u>

Submission No: RDEP-Drft-0018

Commenter: John Bathke, Historic Preservation Officer for the Quechan Indian Tribe, Yuma Meeting Transcript

Comment: Obviously, there's the studies that are done, but we would specifically like to see an ethnography, trails studies, and regional synthesis studies done before each project. This has become problematic with Genesis, it's becoming problematic with Ocotillo, and I think it would alleviate a lot of headaches if we did that pre-application.

Submission No: RDEP-Drft-0020

Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes

Comment: Cultural Resource Design Feature 17: “Unexpected discovery of cultural resources” must be better defined. CRIT recommends that work shall be halted for all resources—even so-called “isolates” until evaluation can proceed. Potentially affected tribes shall be notified within 24 hours of all discoveries.

Submission No: RDEP-Drft-0020

Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes

Comment: Cultural Resource Design Feature 13: The text should be revised to make clear that avoidance of known cultural resources is always the preferred resolution option. In addition, a plan for previously unknown cultural resources shall be prepared for all projects. In addition to the measures suggested, the plan should also include consultation with potentially affected Tribes and notification of such tribes, within 24 hours, in the event of an

unexpected discovery. Finally, the unexpected discovery plan should require avoidance of the new site if avoidance is feasible. The agency shall support a determination of infeasibility with substantial evidence.

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: Cultural Resource Design Feature 14: A 100 percent archaeological surface survey is not a “treatment plan,” but a prerequisite to informed decision-making. If it appears, based on a Class II inventory, that there is any possibility of cultural resources on the project site, a Class III survey must be completed prior to project approval.

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: Cultural Resource Design Feature 15: BLM shall engage all potentially affected Tribes to determine if a tribal monitor is recommended for the Project. In all cases where a tribal monitor is recommended, BLM shall prepare a monitoring plan.

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: Native American Concerns BMP 88: Where there is a reasonable expectation of encountering unidentified cultural resources during construction, monitoring, by both cultural resource specialists and tribal monitors, must be required.

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: According to the spiritual beliefs of many of CRIT’s members, the disturbance and removal of cultural resources from the locations where such resources were left by their ancestors—even if completed in the name of “data recovery” or preservation—is taboo. This concern is heightened if the removal is completed by non-members acting without regard to the spiritual practices. As such, the best, and in CRIT’s opinion, the only, mitigation measure for significant impacts to cultural resources affiliated with the Tribes is avoidance.
While the DEIS states a preference for avoidance (e.g., DEIS 4-21), the DEIS must be revised to more fully support avoidance as the preferred mitigation measure, and the one to be employed in virtually all circumstances where cultural resources are potentially impacted. In particular, the DEIS currently states that “[f]or subsurface sites discovered accidentally during earthmoving activities, the requirements for data collection would salvage important scientific data for future use.” DEIS 4-24. This language must be revised to ensure that avoidance of newly discovered resources is considered first and foremost."

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: Native American Concerns BMP 89: Any determination that avoidance of visual intrusion is not “possible” must be made in consultation with potentially affected tribes and supported by substantial evidence.

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: Native American Concerns Design Feature 116: Any determination that avoidance is “not possible” must be made in consultation with potentially affected tribes and supported by substantial evidence.

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: Native American Concerns Design Feature 116 + 117: Please clarify the process for determining which plants and wildlife species are “culturally important” These species should be identified prior to submission of any project tiered off of this EIS. Any determination that avoidance is “not possible” must be made in consultation with

potentially affected tribes and supported by substantial evidence.

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: Native American Concerns Design Feature 120: Any determination that avoidance is “not possible” must be made in consultation with potentially affected tribes and supported by substantial evidence. CRIT does not believe that any of the proposed “possible mitigations” adequately mitigate for the disturbance of such cultural resources.

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: Historic Properties Treatment Plan: The HPTP must be developed in consultation with potentially affect tribes. Adequate time must be given for consultation on these documents. The Plan must specify that any determination that avoidance is “not possible” must be made in consultation with potentially affected tribes and supported by substantial evidence. Tribal monitors must be present when the project has any potential to affect cultural resources significant to tribes and tribes must be notified within 24 hours of any unexpected discovery. A 100 percent archaeological surface survey is not a “treatment plan,” but a prerequisite to informed decision-making, If it appears, based on a Class II inventory, that there is any possibility of cultural resources on the project site, a Class III survey must be completed prior to project approval.

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: Cultural Resource Design Feature 10: A Class II inventory shall be required for all project areas where no previous survey has been completed, or where a previous survey has indicated the potential presence of cultural resource materials.

Formerly Used Defense Sites

Summary:

The document should discuss formerly used defense sites in the cultural resources section if the areas were associated with World War II-era historic sites.

Response:

As noted in comments, the affected environment discussion in chapter 3 omitted any discussion of the historic sites, such as historic military sites like Camp Horn and Camp Hyder, two significant World War II-era divisional training camps. Section 3.4.1, Cultural Resources, has been revised in the Final EIS to account for these historic military sites and any associated ordnance.

Comments:

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: Page 182, the discussion regarding the Northern Patayan Cultural Region seems to generally omit references to the sizable World War II-era, Formerly Used Defense Sites (FUDS) within Mohave County, still under study by the Army Corp of Engineers and Arizona Department of Environmental Quality. It is difficult to envision how a site that may have been compromised by military debris would have "cultural" value, however IF that can be said of Formerly Used Defense Sites, the document may want to reference the presence of known FUDS in Mohave County, as it seems to similarly identify former military uses in other parts of the state, namely in the Agua Caliente SEZ.

Baseline Information and Impact Analysis

Summary:

The EIS analysis for cultural resources is based on incomplete and insufficient information; therefore, it must be revised.

Response:

As noted in the Draft EIS, the RDEP EIS is a programmatic approach to planning on BLM-administered lands in Arizona; the descriptions of the affected environment and the analysis in environmental consequences is of sufficient detail to support the programmatic nature of the EIS. Impacts associated with renewable energy were generally described in Section 4.2.3, Cultural Resources. Once an application is under consideration, site-specific descriptions of the area's resources would be included in the NEPA analysis, and particular elements of a project's design would provide the context for specific impacts.

It is also important to recognize that the REDAs are identified for potential development. Any proposal for an actual project would require due diligence, including NHPA and NEPA compliance. At this project level of the process, the proposed application boundaries of the projects would be reviewed against the data layers to determine if there are additional issues that could not be recognized at the larger landscape scale. Of particular note are protected species and cultural resources that require mandated consultations.

For future applications that could be proposed (whether inside or outside the REDAs), pre-application meetings are required under the Solar Energy Development Program and would be helpful for a project developed on lands not yet surveyed for cultural resources. The BLM and other stakeholders, including tribes, could provide some sense of the potential for significant resources in the area during the pre-application process. A records check is required before any Class II or Class III surveys in order to familiarize the researcher with the area and to help define the survey strategy. Consultation with tribes and local historians and other basic research strategies would provide valuable information and context for any project inventories. A Class II sampling survey would provide additional information if there were still sufficient gaps in what might be present in the prospective project area. After all of the due diligence, if the land continues to have potential for development, the Class III survey would be required for the remaining lands as part of the application process.

Comments:

Submission No: RDEP-Drft-0004

Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe

Comment: Here, the analysis of cultural resource impacts is based on incomplete and insufficient identification efforts. The DEIS notes that surveys would be necessary for any projects in the Lower Gila Cultural Region in order to identify cultural resources within the project area. Cultural Resources, 3-15. As noted above, BLM has not conducted any surveys in the Agua Caliente SEZ, and many nearby artifacts have not yet been evaluated. Id. at 3-20 - 3-22. As of 2003, less than seven percent of BLM-administered land in Arizona had been surveyed for cultural resources. Id. at 3-12. Based upon predictive modeling, thousands of new cultural resources could be present within the six Renewable Energy Development Areas (REDA) alternatives. Id.

Submission No: RDEP-Drft-0004

Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe

Comment: In addition to the direct destruction of cultural resources that could result from renewable energy projects, the Tribe is concerned about indirect visual impacts. The DEIS states that developments would be visible from important mountains and highlands, including Sears Point ACEC and Eagle Mountains, Signal Mountain, and Woolsey Peak Wilderness Areas. Cumulative Impacts, 5-51. The cultural and ceremonial use of the landscape will be impaired when thousands of solar pedestals are visible from these areas. The cumulative analysis of the visual impacts is insufficient, as no glint/glare study was conducted, and the DEIS failed to enumerate the environmental effects of related projects, and the interaction of the projects.

Submission No: RDEP-Drft-0004
Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe
Comment: The DEIS states that project proposals would be evaluated based on the NHPA § 106 requirements (Environmental Consequences (Cultural Resources), 4-18 - 4-19), but it is impossible for the BLM to determine the impact of the RDEP on cultural resources absent an initial finding of what cultural resources exist within any REDA, BLM-administered land, or the SEZ. The DEIS also puts forth that mitigation measures could decrease adverse impacts to cultural resources (Id. at 4-21). Mitigation measures cannot be however, until the cultural resources are identified and evaluated. In addition, impacts to sensitive cultural resources generally cannot be reduced through mitigation.
The inadequate identification efforts make it impossible for the decision-makers and interested public to reasonably evaluate the cultural significance of the area and the full extent of the impacts that the RDEP will cause to the cultural landscape. Marsh v. Oregon Natural Resources Council, 490 U.S. 360 (1989) (noting a primary purpose of NEPA is to foster both informed decision making and informed public participation). This also violates the obligation to make a good faith effort to identify cultural resources of concern to interested Indian tribes. See 36 C.F.R. § 800.4(b) (requiring agency to make reasonable and good faith effort to identify historic properties affected by undertaking). BLM must identify and evaluate the cultural resources present in lands affected by the RDEP in order to comply with NEPA and the NHPA.

Submission No: RDEP-Drft-0004
Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe
Comment: The DEIS contains no actual analysis of the impact to cultural resources resulting from the proposed development of renewable energy projects throughout Arizona. Notably, the DEIS states that the RDEP would not impact cultural resources, and would only have indirect effects. Cumulative Impacts, 5-12. The DEIS, however, also states that cultural resources could be completely destroyed by the clearing, grading, and excavation of a RDEP project area alone. Environmental Consequences (Cultural Resources), 4-20. This analysis is inconsistent. The OEIS goes on to briefly discuss indirect impacts to cultural resources based on each of the REDA alternatives and the SEZ, yet the analysis consists of nothing more than statements that cultural resource loss could occur, though mitigation measures could reduce such impact. Id. at 5-12 - 5-15. This cursory analysis fails to satisfy NEPA requirements. City of Carmel- By- The-Sea v. United States Department of Transportation, 123 F.3d 1142 (1997).

Submission No: RDEP-Drft-0004
Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe
Comment: This deferral also mars the DEIS's analysis of alternatives. In comparing alternatives, the EIR makes the generic assumption that each square mile of the identified REDA would contain just over 10 archaeological sites. DEIS 4-18 to 28. This assumption is applied without regard to the likelihood of encountering sites, even though DEIS acknowledges that certain types of lands are significantly more likely to contain cultural resources. DEIS 4-19 to 20 ("[C]ultural resource density increases in proximity to water. Any construction projects undertaken within the proposed REDAs that occur near major or seasonal

drainages, springs, or playa zones would increase the potential for impacts on prehistoric or historic cultural resources."); 4-22 ("[T]he areas of potential cultural significance, whether prehistoric or historic, would mostly likely be near dry lake beds, in dune areas, or along washes."); see also DEIS 3-12 ("the numbers, density, and distribution of the resources vary widely over geographic areas"). As such, the only reported difference between the various alternatives is based on total acreage of disturbed land. This generic analysis precludes informed decision-making. The EIR should be revised to take into account the characteristic of the lands included in each alternative, to determine whether certain alternative would result in a greater likelihood of cultural resource sites per acre. (continued below)

Submission No: RDEP-Drft-0020

Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes

Comment: Second, the DEIS appears to omit specific information on cultural resources based on an assumption that areas with other sensitive resources overlap with areas of sensitive cultural resources. The DEIS makes clear that complete cultural resource information was not included in the initial screen. Table ES-2, which lists the areas screened out from the REDAs, does not include any specific cultural resource datasets. Elsewhere, the DEIS confirms that NRHP-listed properties are included in the REDAs (DEIS 4-23), no Class I review of cultural resources was completed (DEIS 3-13), that existing archaeological surveys are woefully incomplete (DEIS 4-23), and that the "presence, absence, or location of tribal interests and heritage resources . . . are not fully known." DEIS 4-72.

However, the DEIS then assumes that areas of "high [cultural resource] site density [] are not part of the REDA." DEIS 3-12; see also DEIS 2-50 ("It is unlikely that many known NRHP-eligible sites would be affected by development within the REDA."); 5-28 ("[TIhe REDAs would reduce the cumulative impacts on traditional territories by focusing development on areas of relatively low resources sensitivity. . . and in disturbed zones or areas near existing infrastructure."). As discussed above, the DEIS must be revised to identify areas of significant cultural resources and eliminate them from the REDA. At the very least, however, the DEIS should clarify exactly how significant cultural resources will be avoided, given that they are not specifically screened from the REDA. The DEIS must also support any assumptions based on correlation to other sensitive resource areas. If such correlations cannot be adequately supported, the DEIS must be revised to more accurately present the state of knowledge regarding the presence of absence of cultural resources within the REDA.

G.2.4 Cumulative Analysis

Analysis Area

Summary:

The cumulative analysis boundary should be extended to include California, Utah, Colorado, and New Mexico.

Response:

The RDEP identifies lands across Arizona that are most suitable for the development of renewable energy. The proposed land use allocations are at the planning-level scale and would not authorize any specific projects or imply such approval. Any proposal for a wind or solar energy project will still require site specific permitting, additional environmental analysis, and NEPA compliance. It would be speculative at this time to assume particular cumulative effects from any post-RDEP BLM Arizona or non-Arizona projects. If and when future BLM AZ projects are proposed and BLM has more data about the likely cumulative effects of those projects, including the likely geographic scope of those cumulative effects, the BLM will consider those effects through future site-specific NEPA. The environmental consequences presented in this EIS document the types and general magnitude of impacts that could be

anticipated from typical solar and wind energy developments. Applications for site-specific projects near state boundaries will assess the cumulative impacts of those actions and others within the appropriate distance to adequately asses the cumulative effects.

Comments:

Submission No: RDEP-Drft-0047
Commenter: Kenneth L. Sizemore, Five County Association of Governments
Comment: The analysis stops at state boundaries, and does not adequately consider impacts to adjacent communities in Utah. No scoping sessions were held north of the Grand Canyon. The analysis should be refined to include impacts to St. George and Kanab, UT.

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: Here, the DEIS artificially constrains the cumulative impact analysis by focusing solely on renewable energy projects in Arizona. DEIS 5-12.This geographic limitation ignores the fact that directly across the border in California, BLM is proposing a slew of renewable energy projects on federal land, including at over a dozen within a 50 mile radius of the CRIT reservation. That another division of BLM is preparing these projects is not a sufficient excuse for ignoring their clear cumulative impacts.

Analysis Scope

Summary:

The scope of cumulative analysis should include past activities, including transmission lines.

Response:

The scope of the cumulative analysis is generally described in Section 5.1.2, Past, Present, and Reasonably Foreseeable Future Actions. The section notes that “Effects of past actions and activities are manifested in the current condition of the resources, as described in the affected environment”; the existing ROW infrastructure is discussed in Section 3.8.1, Lands and Realty RDEP Affected Environment. It is also important to recognize that the REDAs are identified for potential development. Any proposal for an actual project would require due diligence, including NEPA compliance. It would be speculative at this time to assume particular cumulative effects from any post-RDEP BLM Arizona or non-Arizona projects. If and when future BLM AZ projects are proposed and BLM has more data about the likely cumulative effects of those projects, including the likely geographic scope of those cumulative effects, the BLM will consider those effects through future site-specific NEPA. At the site specific level, the proposed application design and requirements would be reviewed against the existing infrastructure to determine whether an upgrade is needed depends on the scale of the proposed development, and what impacts may result from the new project requirements.

Comments:

Submission No: RDEP-Drft-0022
Commenter: Elizabeth Webb
Comment: Recognition that some older transmission lines were sited before there was a more rigorous environmental review and as such some areas with existing infrastructure may not be appropriate for further energy expansion. Cumulative impacts can be a significant concern.

G.2.5 Wildlife – Naming Convention

Summary:

The BLM should correct the name of the Arizona desert tortoise.

Response:

The BLM will recognize the taxonomic change of the Sonoran desert tortoise population when accepted by the U.S. Fish and Wildlife Service.

Comments:

Submission No: RDEP-Drft-0007

Commenter: Greta Anderson, Western Watersheds Project

Comment: The DEIS should correct the taxonomic nomenclature for desert tortoise. The Sonoran desert tortoise is now Gopherus morafkai (Murphy et al., 2011). It is reported incorrectly throughout the document.

Submission No: RDEP- Drft-0011

Commenter: Desert Tortoise Council

Comment: We suggest the Arizona tortoise be named separately from the Mojave tortoise as Gopherus morafkai, Morafka's desert tortoise or the Sonoran desert tortoise (Murphy et al. 2011).Murphy RW, Berry KH, Edwards T, Leviton AE, Lathrop A, Riedle JD (2011) The dazed and confused identity of Agassiz's land tortoise, Gopherus agassizii (Testudines, Testudinidae) with the description of a new species, and its consequences for conservation. ZooKeys 113: 39–71.

G.2.6 Geographic Information System

Data Availability

Summary:

The BLM should make all the RDEP datasets available to the public. If information is too sensitive to release to the public, then the BLM needs to explain why the dataset is not available.

Response:

The BLM has and will continue to make GIS datasets available. The RDEP uses some datasets that contain sensitive data, such as known location of sensitive species and cultural sites, or are administered and owned by other agencies, such as AGFD. For the Final EIS the BLM will post a full listing of datasets and explain why any sets are not available and contact information on where to obtain datasets not controlled by the BLM.

Comments:

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: Lastly, the BLM needs to provide a mechanism by which the public can freely access publicly available data used in the DEIS, while still respecting data sensitivities. And, given significant errors that we found in the spatial datasets provided by the BLM, we recommend that the BLM should make available a complete, fully accurate dataset.

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: For non-sensitive data, all GIS data layers used as screens in RDEP should be accessible for download directly from the BLM's RDEP Web page,

or from that of the cooperating agency, and should be available as Google Earth (.kml or .kmz) files in addition to standard GIS formats. These data should include detailed metadata and attributes.2 Metadata for mapped wildlife habitats, predictive habitat models and composite outputs that have been used as screens should include reference to the methodologies employed for mapping and model development, and include a description of how they were applied as a screen in RDEP. Statistics and maps elucidating how wildlife-related screens characterize the proposed REDAs, nominated sites and Agua Caliente Solar Energy Zone should be made available.

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: Although BLM made available some of the data layers used on the DEIS website, that information did not include the data layers provided by the AGFD.
Without the needed information, we are left with a very general understanding of the way in which BLM applied the wildlife-related screens, including AGFD's Species and Habitat Conservation Guide (SHCG). The narrative provided for the application of the AGFD's SHCG is very general (DEIS, pages 4-42 and 4-46), and does not provide sufficient detail as to how other screens, such as those related to big game were developed, selected (or rejected) and applied.

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: For non-sensitive data, all GIS data layers used as screens in RDEP should be accessible for download directly from the BLM's RDEP Web page, or from that of the cooperating agency, and should be available as Google Earth (.kml or .kmz) files in addition to standard GIS formats. These data should include detailed metadata and attributes.4 Metadata for mapped wildlife habitats, predictive habitat models and composite outputs that have been used as screens should include reference to the methodologies employed for mapping and model development, and include a description of how they were applied as a screen in RDEP. Statistics and maps elucidating how wildlife-related screens characterize the proposed REDAs, nominated sites and Agua Caliente Solar Energy Zone should be made available.

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: For sensitive data, the BLM should explain why this information is unavailable and provide a means for the public to request either the data layers or specific data analyses.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: For sensitive data, the BLM should explain why this information is unavailable and provide a means for the public to request either the data layers or specific data analyses.

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: Recommendation: The BLM needs to provide a mechanism by which the public can freely access publicly available data used in the DEIS, while still respecting data sensitivities.

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: Not only have these data errors prevented us from conducting accurate analyses, we are concerned that inaccuracies or offsets in these layers may result in a failure to detect areas of high resource value within proposed REDAs, areas that were intended to be screened out. Statistics generated based upon these same layers may also be inaccurate. We measured an approximately 209 meter offset in the original dataset provided, and an 80 meter offset in the modified version provided to us on 05/15/12. The occurrence of these errors raise a concern that there may be other errors in the datasets we have not yet been able to detect. The BLM has an obligation to provide accurate data

to the public and to correct the administrative record.
Recommendation: BLM should make available to the public a complete, fully accurate dataset.

Submission No: RDEP-Drft-0003
Commenter: Amanda Ormond, Interwest Energy Alliance
Comment: Recommendation 8 – Transparency of Data Layers.
The BLM has incorporated several data layers that come from state agencies, yet those data are not readily accessible for review and/or deemed confidential. Therefore, it is impossible for Interwest to comment on the appropriateness of inclusion of some layers. Further, including these data and not have them be accessible for review is in essence deferring decisions on federal land management to state agencies.
Interwest recommends that BLM work with state agencies to make available data layers that are used in the RDEP process. For layers that are deemed sensitive the Department should identify a process to work with those seeking information to provide the information while maintaining confidentiality.

Data Corrections

Summary:
The BLM needs to correct the GIS datasets.

Response:
The datasets have been corrected for the Final EIS.

Comments:
Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: 1) We encountered significant data errors that hampered our ability to provide timely, accurate, and helpful comments regarding wildlife impacts to the BLM, and which raise concerns regarding the ultimate accuracy of the heavily geospatial RDEP process.
2) The original public data were not internally consistent. For example: the RDEP_REDA_alt1_max_BLM.shp and the RDEP_REDA_alt1_max_nonBLM.shp shapefiles overlap one another, which they should not given that they are based on land ownership; and
3) The original data in question were defined as NAD_1983_UTM_Zone_12N. However, they do not line up correctly with the AZDFG data as they should. It appears that this is because the data were potentially defined with the incorrect datum. Re-defining the data only partially fixes this registration issue and therefore this potential solution does not fix the alignment problem.
4) The land ownership positioning issue was rectified in the modified dataset. However, there is still a positioning issue for polygons related to the Species and Habitat Conservation Guide (SHCG) which places SHCG related polygons outside of the low SHCG categories from which they were likely derived, into higher ones that they are obviously not intended to be in. Also only the BLM half of each alternative dataset was provided. The non-BLM parcels have not been corrected.

Independent Verification

Summary:
The RDEP datasets should be independently verified to assess their accuracy.

Response:
The Final EIS GIS data were created by the BLM Arizona State Office, in conjunction with the BLM's contractor EMPSi. The Draft EIS GIS data were posted on the RDEP website, which provides an opportunity for independent verification. The Final EIS GIS's metadata includes descriptions of the methodology used to develop the REDA alternatives, and is available online at the RDEP Web site.

Comments:
Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: Given the inaccuracies discovered in the BLM's dataset for the DEIS, we are concerned that these same data might have been used by the BLM in their own analyses and development of the REDAs and the Agua Caliente SEZ. The accuracy of the data used in this process needs to be verified.

G.2.7 Impact Analysis

Climate Change Assumptions

Summary:
BLM's assumption that energy produced would be the same across all alternatives is incorrect and needs to be modified.

Response:
As noted in Section 4.1.3 Analytical Assumptions, several assumptions were made to facilitate the analysis of the projected impacts. These assumptions set guidelines and provide reasonably foreseeable projected levels of development that would occur within the RDEP planning area and timeframe. These assumptions should not be interpreted as constraining or redefining the management objectives and actions proposed for each alternative, as described in Chapter 2, Alternatives. The commenter is correct in noting that acreage differences between alternatives can result in variation of intensity and context of effects across alternatives. However, the action alternatives are not much more restrictive of one as compared to the others; notwithstanding the acreage differences, the alternatives that would identify fewer REDA lands would not actually be much more restrictive for renewable energy development than alternatives with more REDA lands. The stated assumption did not adequately represent the basis for the climate change analysis. It has been modified in Section 4.2.2 in the Final EIS to better explain that anticipated development for renewable energy, as expressed in the RFDS, is the starting point for the analysis.

Comments:
Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: Page 369, Section 4.2.2, states that one assumption made in the impact analysis is that "The overall amount of energy provided by renewable sources would be the same under each alternative." Since some of the alternatives are much more restrictive (by area) than others, it is hard to see how that assumption can be made. Stated another way, it is difficult to see how those assumptions could be accurate. Some alternatives would limit the amount of usable areas substantially, relative to other alternatives. Surely the acreage available under each alternative has to play an important role in calculating how much electrical generation is possible under each scenario.

Mitigation Measures

Summary:

The BLM needs to include mitigation measures with all elements of CEQ Regulation 1508.20.

Response:

The RDEP identifies lands across Arizona that are most suitable for the development of renewable energy. This proposed land use allocation is at the planning-level scale and would not authorize any specific projects or imply such approval. Any proposal for a wind or solar energy project will still require site specific permitting, additional environmental analysis, and NEPA compliance. The environmental consequences presented in this EIS document the types and general magnitude of impacts that could be anticipated from typical solar and wind energy developments.

Site specific mitigation measures would be applied to respond to the unique impacts and setting for a particular project.

All of the design features and BMPs listed in Appendix B were intended to avoid, minimize, or mitigate potential resource conflicts, such as impacts on critical wildlife habitat or impacts from siting a project near sensitive viewsheds. The design features and BMPs were reviewed in light of the revised design features of the Solar Energy Final Programmatic EIS and the Wind PEIS ROD. The BLM determined that most of the RDEP's suggested mitigation measures duplicated national program guidance; in order to reduce the duplication, RDEP's mitigation measures have been modified to conform to the BLM's national solar energy and wind energy programs. Appendix B, Design Features and Best Management Practices, has been modified to incorporate by reference the national solar energy program design features, as described in the Solar Final Programmatic EIS, and the wind energy program BMPs, as described in the Wind PEIS ROD. Only those design features and BMPs that are unique to Arizona and REDA lands are specifically noted in the revised Appendix B. Each project specific application will be subject to analysis and may have other site specific design features or mitigation.

Comments:

Submission No: RDEP-Drft-0007
Commenter: Greta Anderson, Western Watersheds Project
Comment: The scale of the degradation and loss of the public lands that could result from the RDEP process is unprecedented, which makes consideration of appropriate mitigation measures difficult. All of the mitigation measures outlined in §1508.20 are applicable to various aspects of solar energy development.

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: Mitigation: Although it appears that REDA lands are relatively unencumbered by significant environmental conflicts, mitigation measures should be considered to address impacts to natural resources and public values.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Mitigation: Although it appears that REDA lands are relatively unencumbered by significant environmental conflicts, mitigation measures should be considered to address impacts to natural resources and public values.

Regional Mitigation Plan

Summary:

The BLM should consider a regional mitigation plan requirement as part of the design features.

Response:

The RDEP identifies lands across Arizona that are most suitable for the development of renewable energy. The proposed land use allocations are at the planning-level scale and would not authorize any specific projects or imply such approval. Any proposal for a wind or solar energy project will still require site specific permitting, additional environmental analysis, and NEPA compliance. Mitigation requirements will be applied on a project specific level.

Regional Mitigation Planning is currently being piloted by the national Solar Program and is discussed in detail in the Solar Final PEIS (see Section A.2.5 of Appendix A of the Final Solar PEIS). Should a Regional Mitigation Plan become an effective tool then they BLM Arizona will determine how best to apply it to SEZs and REDAs.

Comments:

Submission No: RDEP-Drft-0009

Commenter: Rob Marshall, MFS, The Nature Conservancy

Comment: An example of a regional mitigation plan to offset unavoidable impacts would encompasses a robust compensatory program with the following six elements:

1. An ecological baseline upon which unavoidable impacts are assessed.

What is the current ecological status of the landscapes to be developed? What is the habitat quality and level of intactness, where do the species occur and what is their population status and viability? What species are rare, sensitive, endemic, threatened, endangered? What are the aquatic, surface water and groundwater resources and what is their status? Where are the wildlife migratory corridors, where is connectivity of habitats critical in the face of climate change? What ecological trends are underway and how do we expect them to impact species and habitats? The information and data to inform these and other questions form the ecological baseline from which to assess the impacts, both site specific and cumulative, from renewable energy development.

2. A mechanism to assess & quantify unavoidable impacts over the life of the impacts.

There is a growing body of work to develop methodologies to assess impacts from development. BLM has participated in the development of several, and a wide array created by BLM, other federal and state agencies, academia, consultants, etc., have been used to assess impacts on BLM-administered lands. Whatever methodology is selected, it should be transparent and based on best available scientific techniques. It should capture impacts beyond those to federal and state ESA-listed species, BLM Species of Concern and Sensitive Species, and habitats protected under the Clean Water Act. It should also capture cumulative impacts, and the temporal nature of impacts, i.e. over the life of the impact (likely in perpetuity).

3. A methodology to translate the impacts into dollars, i.e. mitigation investments – including sufficient funding to manage and monitor the mitigation investments.

Similar to (2.) above, extensive work has gone into and continues to develop methodologies to translate ecological impacts into dollars or mitigation investments and actions. Again, transparency and consistency in the use of the methodology is important. Importantly, the costs of assessing the impacts, and the monitoring and managing the mitigation investments over the life of the impacts needs to be included in the cost of mitigation, and thus the amount of mitigation investment that the project proponent is responsible for. However, the costs of mitigation cannot be so high, or

unreasonable, that development cannot occur – a key facet is to avoid impacts to areas that are "unmitigatable," i.e. ecological resources that cannot be replaced or are extremely rare, or where the impacts are so extensive as to drive the costs of mitigation to a level beyond a reasonable level, such as has been largely accomplished, with several omissions noted in these comments, by BLM's RDEP process.

4. A structure to hold and apply mitigation investments.

Given BLM cannot hold mitigation funds, a structure such as a 3rd party arrangement with fiduciary responsibility (and demonstrated fiduciary experience) should be implemented to hold, manage and allocate mitigation investments. Structures should be regionally/landscape or state based to ensure mitigation investments are responding to impacts on the specific landscape being impacted. Structures should also include representation by agencies such as BLM, State Fish and Game agencies, and U.S. Fish and Wildlife Service. Involvement by key stakeholders in an advisory and oversight role, i.e. counties, conservation community, industry, sportsmen/recreation, etc., would also be important to the long-term success of a mitigation program.

5. A prioritization, e.g. conservation plan, as to where and how mitigation investments should be made.

Where and how should mitigation investments be used to ensure the highest return on investment? What "tools" should be used to implement mitigation, i.e. land acquisition, withdrawing BLM-administered lands from other uses, changing land designations or uses, restoration, mitigation banks, etc. How are conservation priorities established, especially relative to potential impacts?

At a minimum, we recommend BLM develop a regional conservation plan, such as at an ecoregional scale as described above. Plans should be driven by the best data as the basis for establishing conservation priorities. Conservation plans should seek to prioritize actions to address conservation priorities that achieve the best conservation return on investment.

6. Monitoring to ensure mitigation investments are adequate relative to impacts over the life of the impacts.

Monitoring and adaptive management are key to a successful mitigation program. We recommend the establishment of an adaptive management program (i.e. specifically implement AIM across the region) with long term monitoring and assured funding from project proponents for the life of the project.

Submission No: RDEP-Drft-0009

Commenter: Rob Marshall, MFS, The Nature Conservancy

Comment: By regional scale we mean a scale such as ecoregions, for example, which share similar plant communities and species and, thus, make like for like habitat compensation more straightforward and increase the likelihood that sufficient wildlife habitat remains intact. This approach can benefit from currently-available regional landscape-scale ecological assessments, such as BLM's rapid ecoregional assessments, state wildlife action plan data such as the Arizona Game and Fish Departments Habimap Arizona, or TNC's ecoregional and other regional-scale conservation assessments.

To ensure unavoidable impacts are fully offset, the Conservancy recommends that BLM establish an off-site mitigation program that, in addition to the potential for acquisition of private lands, allows mitigation on BLM-administered lands where impacts cannot be addressed through acquisition and long-term management of private lands; allows "mitigation banking" on BLM-administered lands where conservation designation and/or management can achieve mitigation needs/outcomes relative to specific impacts to habitats and associated species; ensures adequate funding over time to achieve mitigation outcomes; creates third party-managed endowments of mitigation funds to manage and direct mitigation investments and activities; and ensures monitoring and adaptive management to ensure mitigation is adequate relative to impacts over time. Below we outline additional specifics on the elements of a regional mitigation plan. (continued below)

Submission No: RDEP-Drft-0009
Commenter: Rob Marshall, MFS, The Nature Conservancy
Comment: 3) Implement Mitigation Hierarchy at Regional Scale to Achieve Lasting, Tangible Results
We commend BLM for the considerable attention to on-site best management practices that would avoid or minimize adverse environmental impacts. Less attention has been focused in the RDEP DEIS, however, on how BLM will resolve unavoidable impacts to natural resource values. As emphasized in The Nature Conservancy's comments on BLM's Solar Draft Programmatic EIS for Six Southwestern States, current utility scale solar technologies permanently eliminate habitat and displace species, as well as eliminate most other uses of BLM-administered lands. As a result, on-site mitigation to offset habitat loss/fragmentation and other impacts is largely impossible, leaving off-site mitigation the primary (if not the only) option. While we recognize that the purpose of RDEP is to proactively guide infrastructure away from sensitive natural resources, we believe it is important for BLM to develop and implement a clear and comprehensive plan for unavoidable impacts to sensitive or regionally important natural resources.
We recommend that BLM create a mitigation framework at a regional scale to ensure mitigation efforts yield lasting, tangible results, including an offset program that compensates for loss of high ecological value habitat with like habitat off-site. One rationale for a regional framework is the leverage that can be gained by combining offsets for unavoidable impacts from RDEP projects with those from other infrastructure projects such as SEZs. The potential to combine mitigation needs under one regional plan will make mitigation efforts less costly and more effective than a project by project approach that typically results in a patchwork of small mitigation sites that are of insufficient scale and connectivity to be ecologically viable or to fully offset impacts over time.

G.2.8 Soils – Affected Environment

Summary:
The BLM should consider the commenter's suggested new NRCS soil data sources.

Response:
All available NRCS soil survey data were considered in the development of the DEIS, as discussed in detail in Section 3.17.1, Soil Resources, under affected environment and in Section 4.2.17, Soil Resources, under the impacts analysis. Due to the scale of the project, only soil orders for the entire planning area were discussed rather than individual soil series. As the analysis for the SEZ was more site specific, the analysis included discussion of the individual soil series. Impacts by soil order for the planning areas and by soil series for the SEZ are included in Section 4.2.17 (see Tables 4.6-4.13). Specific NRCS references used are provided in Chapter 8, References. The BLM recognizes that at this scale of planning there will be incomplete or unavailable information, such as a lack of ground-truthing of the NRCS data used or unavailability of soil field inventories (see Section 4.1.4, Incomplete or Unavailable Information). Should a developer propose a project within a REDA, then either the ground-truthing or soil field inventory may be conducted as needed as a component of site-specific NEPA analysis before project approval and development.

Comments:

Submission No: RDEP-Drft-0042

Commenter: Kirk Brus, Army Corps of Engineers

Comment: Chapter 4.14 Incomplete or Unavailable Information, specifically the discussion: "Some of the major types of data that are incomplete or unavailable include the following: "Field inventory of soils and water conditions" A reference on soils (inventory), from the NRCS, is located at the following weblink: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

G.2.9 Implementation – Existing Applications

Summary:

The BLM needs to clarify how existing applications would be processed once REDAs are allocated.

Response:

The process for processing applications would follow the BLM's National Solar Program guidance, as described in the Solar Program Record of Decision. The BLM defines 'pending' applications as any applications (regardless of place in line) filed within proposed variance and/or exclusion areas before the publication of the Supplement to the Draft Solar PEIS (October 28, 2011), and any applications filed within proposed SEZs before June 30, 2009 (see Section 1.3.3.2 of this Final Solar PEIS). Pending applications will continue to be processed in accordance with due diligence and siting requirements under the BLM's existing policies and regulations and will not be subject to any new program elements adopted through the ROD for this Solar PEIS. The BLM will process second-in-line and subsequent applications as pending applications if they otherwise meet the criteria for pending and the corresponding first-in-line application is closed (denied or withdrawn) (Solar Final PEIS, volume 7, Section 3.11.2 Pending Applications).

Comments:

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: Previous Applications: The proposed BP Wind Energy project covers a significant amount of the Mohave REDA, raising questions about how proposed REDAs align with existing applications.

Submission No: RDEP-Drft-0003

Commenter: Amanda Ormond, Interwest Energy Alliance

Comment: Recommendation 4 – Existing Projects on Proposed REDA Lands

Interwest members are actively developing projects in Arizona. It is unclear how, or if existing projects may be affected by the designation of a Renewable Energy Development Area (REDA) through the RDEP process.

Interwest recommends that the Department take care to ensure that currently proposed or pending projects on BLM lands are not negatively affected by the RDEP project.

Submission No: RDEP-Drft-0005

Commenter: Katherine Gensler, Solar Energy Industries Association

Comment: We encourage Arizona BLM to make clear its expectation of a faster permitting process. In addition, we suggest that REDA applications automatically qualify for the "Priority Projects" list or other priority processing scheme that BLM institutes

Submission No: RDEP-Drft-0062

Commenter: Kathleen M. Goforth, Environmental Protection Agency, Environmental Review Office

Comment: We also recommend that the BLM provide additional information, in the FEIS, on the procedures for evaluating renewable energy applications submitted to the BLM. The DEIS

describes the protocol for processing applications for new projects, including new projects proposed outside of a renewable energy development area (REDA) or SEZ; but it is unclear how existing project applications are to be handled (e.g., whether they will be given a lower priority than projects proposed in a REDA or SEZ), and whether they will be subject to the design features and BMPs included in the RDEP.

G.2.10 Lands and Realty – Impact Analysis

Summary:

The BLM needs to clarify why military air training routes would be a hindrance to renewable energy development.

Response:

Placing renewable energy plants and transmission facilities in or near military training routes (MTRs) could create safety issues for military aircraft pilots. However, the presence of MTRs does not preclude renewable energy development. Where MTRs are present, additional coordination with the Federal Aviation Administration (FAA) and Department of Defense (DoD) would be required before a specific project begins.

Supplemental information has been added to Section 3.8.1, Land Use and Realty, of the FEIS to further define MTRs and discuss the applicability of the DoD's AP/1B publication to renewable energy facilities. Minimum AGL data for all MTRs in Arizona is also available in a 2003 map published by the Arizona State Land Department and could help inform the ROW authorization and facility siting processes for future renewable energy development.

Comments:

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: Figure 3-14, Page 226, shows Military Training Routes (air flights). The EIS appears to indicate that the presence of such routes generally would preclude the placement of renewable energy proposals within those areas. Those paths crisscross over large portions of Mohave County. Why would the presence of renewable energy facilities in these areas create a concern?

G.2.11 Livestock Grazing – Impact Analysis

Summary:

The BLM needs to discuss the impacts on wildlife from allowing solar development in the closed allotment within the Agua Caliente SEZ.

Response:

The RDEP FEIS addresses the impacts from the proposed land use plan amendment decisions on the various resources occurring within the SEZ. The proposed RMP amendment decisions are to identify the Agua Caliente SEZ, establish goals, objectives, management actions, and design features for application within the SEZ, identify any specific SEZ design features, change the VRM class from III to IV, and to remove the Wildlife Habitat Management Area allocation and the SRMA designation from within the SEZ boundary (see Section 1.5.2, Decisions on the SEZ). The FEIS presents the range of impacts (direct, indirect, and cumulative) from all these actions on the various resources that occur within the proposed Agua Caliente SEZ including wildlife, livestock grazing, and vegetation. For impacts on

livestock grazing, see Section 4.2.9 for direct and indirect impacts and Section 5.3.8 for cumulative impacts; for impacts on wildlife see Sections 4.2.6 and 5.3.6; for special status species, see Sections 4.2.19 and 5.3.15; and for vegetation, see Sections 4.2.21 and 5.3.17.

As noted in Section 4.2.9, Livestock Grazing, the grazing allotment which overlaps with the Agua Caliente SEZ (the Palomas Allotment) has not had any grazing in the last five years, at a minimum, and has no AUMs, as stated in the Yuma FO FEIS (see Table 4-18). As a result, management decisions in the 2010 ROD to "close" this allotment are likely to have had negligible benefit to wildlife because no practical change in use occurred due to lack of activity under both previous and current management. As such, the development of the Agua Caliente SEZ is not likely to represent a significant cumulative impact on the habitat specifically related to livestock grazing management. However, the BLM recognizes that cumulative impacts could occur on wildlife habitat and would include loss of wildlife habitat; these cumulative impacts of development of the SEZ on wildlife are discussed in Section 5.3.6, Fish and Wildlife.

Comments:

Submission No: RDEP-Drft-0007

Commenter: Greta Anderson, Western Watersheds Project

Comment: The removal of livestock grazing [from the SEZ ephemeral grazing allotment] was pitched as something of a habitat offset for the lands that are still in use under the current ROD, i.e. the closure of some portions of the field office mitigated the ongoing livestock grazing in the northern part of the planning area. However, if solar development occurs on the "closed" allotments, the benefit to wildlife is reduced. The new Agua Caliente SEZ is a cumulative impact in the habitat that should be considered in context of livestock grazing in the field office.

G.2.12 Noise – Impact Analysis

Summary:

The BLM needs to consider noise impacts from renewable energy development.

Response:

Impacts related to noise from renewable energy development are discussed in Section 4.2.12, Noise (pg. 4-75 to 4-82 of the Draft EIS).

Comments:

Submission No: RDEP-Drft-0067

Commenter: Dr. Annita Harlan

Comment: I especially encourage you to consider the impact that generator sound/noise will have on the environment and its inhabitants.

G.2.13 Nominated Sites

Summary:

The BLM should explain how nominated sites factor in to REDAs, and nominated sites should be screened with the same elimination criteria as those used to determine REDAs.

Response:

In the Draft EIS, all nominated sites where carried forward and identified as REDAs based on the assumption that prior uses would have removed or reduced any sensitive resource values. During the public review of the Draft EIS, commenters noted that some of the nominated sites did not appear

disturbed or may still support sensitive resources. To address this issue, the nominated sites have been screened in the Final EIS using the following process:

1. Nominated sites were evaluated using readily-available satellite photographs and site history to determine if they were notably disturbed. Any nominated sites that were determined to be disturbed were brought forward as a REDA.
2. The remaining sites were evaluated using the REDA screening criteria noted above. If they met the REDA requirements, then they were included as a REDA.
3. Sites that had partial disturbance or contained areas with no known sensitive resources, were delineated. The portions of the sites that were disturbed or met REDA screening requirements, were included as REDA.
4. All undisturbed sites containing sensitive resources were not included as REDA.

Additionally, the Butler Valley and Empire Farms sites (both on State lands), and the Fredonia OHV Area, Sonoita Landfill, and the Snowflake Mine sites (BLM-administered lands) were withdrawn from consideration by request of the State of Arizona, the BLM Arizona Strip Field Office, and the BLM Arizona State Office after review of the Draft EIS. These sites are not included as a REDA or in the analysis.

Comments:

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comments: Also, we recommend Species and Habitat Conservation Guide lands of Tiers 4, 5, and 6 and all special status species habitats should be excised from nominated sites. Or, if nominated sites contain a significant amount of Tier 4, 5 and 6 lands and/or special status species habitat, that they be dropped altogether to ensure this subset of lands are consistent with RDEP's original intent. The BLM should work to ensure that the distribution of REDAs into Species and Habitat Conservation Guide tiers is skewed proportionally more towards Tiers 1 & 2 than Tier 3.

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: We have learned from discussions with BLM that the 64 nominated sites are considered REDAs, even though they were subject to a different screening process. The Final EIS should include a more complete description of how the nominated sites relate structurally to the rest of the REDAs, including whether nominated site acreage counts towards the summed total REDA acreage.

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: The current listing of 64 sites (recommended for renewable energy placement due to the fact that they are areas of known damage or existing disturbance to the land) seems an inadequate identification of likely areas of renewable-energy approval. It also raises the question, "are any other lands seriously going to be considered by the BLM for approval of renewable energy placement, other than the 64 sites nominated in this EIS"?

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: Recommendation: We urge the BLM to apply the REDA screens to nominated sites—those nominated sites that would not have passed the full REDA screening should not be included as REDAs under RDEP.

Agricultural Lands

Summary:

The BLM should include a discussion on the potential for acquiring water rights and water resource benefits that could accrue by developing solar facilities on irrigated lands.

Response:

Acquisition of water rights is out of scope for the RDEP as water rights are governed by the State of Arizona. Arizona has five Active Management Areas, located in regions with a heavy reliance on mined groundwater. Active Management Areas are subject to regulation, in accordance with the Arizona Groundwater Code; management goals for the Active Management Area could restrict water-intensive uses, such as solar energy generation requiring water for cooling or condensation. Section 3.3.2 of the nominated sites report (Appendix C in the Final EIS) discusses CSP plant development considerations, including water use.

The BLM would conduct subsequent NEPA analyses for site-specific project and implementation level actions for proposed renewable energy development (Section 1.5.3). These activity plan-level analyses would tier to the REDA analysis and would expand the environmental analysis when more specific information is known. These subsequent NEPA analyses would tier to the land use planning analysis and would evaluate project impacts at the site-specific level (see 40 CFR, Sections 1502.20 and 1508.28). In addition, as required by NEPA, the public would be offered the opportunity to participate in the NEPA process for these specific implementation actions.

Comments:

Submission No: RDEP-Drft-0001

Commenter: Michael J. Lacey, Arizona Division of Water Resources

Comment: Appendix C, Section 2.7, Agricultural Lands. ADWR recommends including a discussion on the potential for acquiring water rights and water resource benefits that may accrue by the development of solar facilities on actively irrigated lands. By example, CSP facilities are being developed and proposed on irrigated lands in the Gila Bend Basin, resulting in significant reductions in potential water use.

Cultural Resources

Summary:

The BLM needs to screen the nominated sites for cultural resources and sensitive tribal resources.

Response:

As noted in the Draft EIS, the RDEP EIS is a programmatic approach to planning allocations across Arizona BLM-administered lands and that the nominated sites are identified for potential development. Any proposal for an actual project would require due diligence, including NEPA compliance. At the project development level, the proposed application boundaries of the projects would be reviewed against the data layers to determine if there are additional issues that could not be recognized at the larger landscape scale.

For future applications that could be proposed (whether inside or outside nominated sites), pre-application meetings are required under the Renewable Energy Development Program and would be helpful for a project developed on lands not yet surveyed for cultural resources. The BLM and other

stakeholders, including tribes, could provide some sense of the potential for significant resources in the area during the pre-application process. A records check is required before any Class II or Class III surveys in order to familiarize the researcher with the area and to help define the survey strategy. Consultation with tribes and local historians and other basic research strategies would provide valuable information and context for any project inventories. A Class II sampling survey would provide additional information if there were still sufficient gaps in what might be present in the prospective project area. After all of the due diligence, if the land continues to have potential for development, the Class III survey would be required for the remaining lands as part of the application process.

Comments:

Submission No: RDEP-Drft-0020

Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes

Comment: The RDEP also identifies previously disturbed sites as REDAs, regardless of potential sensitive resources. The appendix identifies specific disturbed sites, and lists potential resource constraints, including the presence of sensitive species or habitats. However, the listings contained in the appendix make no mention of cultural resources or other tribal constraints. This omission is particularly problematic with respect to sites 14 and 43, which are directly adjacent to the Colorado River Indian Reservation. The listing for site 43, which is over 22,000 acres, states that "there may be fewer environmental constraints associated with this site, which could result in a reduced likelihood for increased permitting and construction costs and public opposition." App. C. CRIT strongly objects to this characterization. The site was previously used for agriculture, which as the DEIS acknowledges, indicates that it "could contain cultural resources or intact archaeological deposits." DEIS 4-3. Moreover, solar development of the site would create significant visual resource impacts from the Reservation, an impact that is glaringly omitted. Similar issues exist with respect to sites 6, 9, 14, 26 and 36. The DEIS must be revised such that the listings properly identify both known and potential constraints posed by cultural resource and tribal concerns.

Submission No: RDEP-Drft-0004

Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe

Comment: The preferred alternative also allows renewable energy projects to be placed on lands that have merely been subject to anthropogenic activity, and such lands could contain significant cultural resources under the surface disturbances. The Bureau of Land Management (BLM) should limit renewable energy projects to lands that have been subject to only the most intensive and permanent disturbances, such as landfills, mines, or gravel pits.

Submission No: RDEP-Drft-0004

Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe

Comment: B. BLM Should Limit Qualified Lands to Only Specific Categories of Significantly and Permanently Disturbed Areas.

According to the DEIS, the RDEP seeks to promote sustainable renewable energy development through reusing disturbed land. Land Reuse, 2-14 - 2-16. The Tribe generally supports locating renewable energy projects on disturbed land, but is concerned that the RDEP could lead to development of such projects on lands that have merely been subject to anthropogenic activity, such as agriculture, OHV - use, or other minor disturbances. While agriculture or OHV -use constitutes a disturbance, those activities may not harm cultural resources buried just below the surface of the land. In fact, cultural resources have been located intact and preserved on lands or areas historically used for agriculture. Southwestern agricultural practices result in relatively shallow soil disruption, which makes it possible for resources to be fully preserved on agricultural lands.

Renewable energy project development, however, could completely destroy significant resources of

cultural value to the Tribe. BLM should define disturbed land to include only lands subjected to past resource-intensive or industrial land uses, such as landfills, mines, or hazardous waste disposal sites. Without a more limited definition of disturbed lands, cultural resources important to the Tribe could be lost forever.

New Site

Summary:

The BLM should consider the Black Mesa mine as an additional newly nominated site.

Response:

While the Draft EIS notes that BLM will consider additional nominated sites proposed through the RDEP planning process, neither the Hopi nor the Navajo tribes have proposed Black Mesa's inclusion as a nominated site during consultations. Additionally, the RDEP Draft EIS notes that whatever decisions are made in the Record of Decision, they will apply only to BLM-administered lands. The information included in the EIS, such as the methodologies for determining renewable energy development areas, is available for use by the tribes if they wish to utilize it for their own planning process.

Comments:

Submission No: RDEP-Drft-0060

Commenter: Beth Rivers, Indigenous Support Coalition of Oregon

Comment: Please consider my nomination of the reclaimed lots of the Black Mesa Mining Complex leasehold as a Renewable Energy Development Area or a Solar Energy Zone. I propose that Arizona BLM analyze these reclaimed strip mined lots of the Black Mesa mine and the Kayenta mine using the same criteria as sites nominated during your scoping period and include them in mapping your blueprint for agencies and renewable energy developers.

National Park System Units

Summary:

The commenters suggest that some nominated sites should be dropped from consideration due to resource conflicts and that nominated sites in the viewshed of NPS units have technological restrictions.

Response:

As noted above in the response to general Nominated Sites, the BLM has rescreened the nominated sites to avoid resource conflicts. As part of this process Detrital Wash has been significantly reduced in size. Additionally, the Fredonia OHV Area and Snowflake Mine site have been withdrawn from consideration by request of the BLM Arizona Strip Field Office.

The BLM appreciates the importance of the setting, character, and resources of National Park System lands. How these lands could be impacted by renewable energy development is very dependent upon the proposed technology and site characteristics (e.g., topography, vegetation, wind direction, viewshed, wildlife corridors, and habitat). Therefore at the planning level it is difficult to conduct such site-specific analysis. To avoid conflicts with National Park System lands, the following management action has been added to the Final EIS in Chapter 2, Alternatives. It applies to all REDAs in the action alternatives and is consistent with direction in the Solar PEIS (BLM and DOE 2012).

Where a wind or solar energy development ROW application is submitted in a REDA that is in an areas identified by the National Park Service as having a high potential for conflict with the resources of a unit of the National Park Service or special areas administered by the National Park Service, additional documentation will be required. This documentation may include information to verify any or all of the following potential resource conditions resulting from the proposed project:

- Increased loading of fine particulates (criteria pollutants: PM 2.5 and PM10 [particulate matter with a diameter of 2.5 µm or less and 10 µm or less, respectively]) and reduced visibility in Class I and sensitive Class II areas;
- Vulnerability of sensitive cultural sites and landscapes, loss of historical interpretative value due to destruction or vandalism;
- Altered frequency and magnitude of floods, and water quantity and quality;
- Reduced habitat quality and integrity and wildlife movement and/or migration corridors; increased isolation and mortality of key species;
- Fragmentation of natural landscapes;
- Diminished wilderness, scenic viewsheds, and night sky values on landscapes within and beyond boundaries of areas administered by the NPS; and
- Diminished cultural landscape qualities within and beyond boundaries administered by the NPS.

Comments:

Submission No: RDEP-Drft-0066
Commenter: John Wessels, National Park Service
Comment: Pipe Spring National Monument (NM)
Our primary concern at Pipe Spring NM is protecting the viewsheds which contribute directly to the feeling of remoteness for the location. This isolation on the Arizona Strip is often mentioned in the historic accounts of the area, and is a prominent interpretive theme that we present to visitors. The primary viewsheds of concern are to the southeast, south and southwest where the expanse of the Arizona Strip is clearly visible for a distance of up to 40 miles, and is substantially undeveloped.
The nominated sites in the RDEP-EIS: 1) #23 (Fredonia Landfill) and 2) #24 (Fredonia OHV Area), are within this primary viewshed, and can be seen from a well-used visitor trail in Pipe Spring NM. However, the view in this direction is already somewhat obscured by other developments in the foreground including structures in the town of Fredonia. For this reason, we may be able to support some of the most common and low profile types of solar energy developments (e.g., photovoltaic panels) in these two tracts. One exception would be the installation of a mirror array and solar tower, which, would be prominently visible throughout the day. We suggest that BLM exclude this particular type of solar development on these lands.

Submission No: RDEP-Drft-0066
Commenter: John Wessels, National Park Service
Comment: Lake Mead National Recreation Area (NRA)
The Detrital Wash (within Site 17) area is described in the RDEP-EIS as a 17,695-acre area having the majority of the ground surface slopes at less than 5% grade, within close proximity to roads and transmission lines and with minimal environmental constraints. We believe that the site also contains outstanding natural and scenic resources that are not adequately described in this document.
Lake Mead NRA includes lands within the northwestern portion of Mohave County, Arizona abutting lands included in Site 17. Lands within Lake Mead NRA and adjacent Bureau of Reclamation and BLM lands can be characterized as being relatively remote and undeveloped, in broken terrain with peaks and ridges surrounded by gently sloping bajadas. The remoteness and character of the lands are further supported by the proposed and designated wilderness along much of the northern boundary of the Site 17 lands.

Ranking Method

Summary:

The BLM needs to revise and improve the ranking method for nominated sites to make it more useful and user friendly.

Response:

Based on comments on the Draft EIS, the ranking process that was used to evaluate the nominated sites for solar and wind energy development in Appendix C of the Draft EIS was removed from the Nominated Sites Report in the Final EIS. Appendix C was revised in the Final EIS to provide background information only for the nominated sites, including solar and wind energy potential, environmental characteristics, and potential remediation or restoration requirements. The nominated sites are not ranked in the Final EIS.

Comments:

Submission No: RDEP-Drft-0007

Commenter: Greta Anderson, Western Watersheds Project

Comment: The discussion of ranking criteria is only marginally useful because for any site, it isn't clear which resources were considered. For example, the "Sensitive Resources and Land Management" rankings (DEIS at 4-3) says each site was screened for 12 criteria. However, the results (table 4-1) do not identify specifically which criteria were met or unmet, leaving it to the reader and the decision-maker to guess at which resources led to which scores. Some of the scores are inexplicable, with more degraded areas receiving lower scores that less degraded areas. (This scoring system is very counter-intuitive for self-evident reasons.) Because the scores aren't explained in the DEIS, it is impossible to know why certain locations scored so low and others so high. More detail should be included in future iterations.

Submission No: RDEP-Drft-0058

Commenter: Buster Johnson, Mohave County Board of Supervisors

Comment: Apparently the BLM intends to factor in all of these considerations, assigning weight to each variable in the equation, based on the perceived value of a given site, in order to come to a decision over applications that it receives. That process appears to be mostly subjective, with few quantifiable variables. Such processes do not instill public confidence in their government.

Submission No: RDEP-Drft-0058

Commenter: Buster Johnson, Mohave County Board of Supervisors

Comment: The draft EIS does include numerous exhibits that offer alternative options for the location of renewable energy projects. It then focuses on 64 damaged properties, areas of known "disturbance", which are given high priority for placement of these proposals. Further, the draft goes on to describe the many reasons why large areas are either off-limits to development, or are sensitive and/or protected to some degree (implying, if not stating, that those designations make approvals less likely in those areas). Taken together, the document seems to present something of a mixed message, in which neither an applicant nor jurisdictions such as Mohave County would be definitively able to decipher whether or not a given site is likely to receive a decision of "yes" or "no" from the BLM, for the siting of a solar field, a wind farm, or similar renewable energy facility.

Re-evaluating sites

Summary:

The BLM needs to reevaluate nominated sites and to eliminate those with sensitive resources, transmission issues, or previous use constraints.

Response:

In the Draft EIS, all nominated sites where carried forward and identified as REDAs based on the assumption that prior uses would have removed or reduced any sensitive resource values. During the public review of the Draft EIS, commenters noted that some of the nominated sites did not appear disturbed or may still support sensitive resources. To address this issue, the nominated sites have been screened in the Final EIS using the following process:

1. Nominated sites were evaluated using readily-available satellite photographs and site history to determine if they were notably disturbed. Any nominated sites that were determined to be disturbed were brought forward as a REDA.
2. The remaining sites were evaluated using the REDA screening criteria noted above. If they met the REDA requirements, then they were included as a REDA.
3. Sites that had partial disturbance or contained areas with no known sensitive resources, were delineated. The portions of the sites that were disturbed or met REDA screening requirements, were included as REDA.
4. All undisturbed sites containing sensitive resources were not included as REDA.

Additionally, the Butler Valley and Empire Farms sites (both on State lands), and the Fredonia OHV Area, Sonoita Landfill, and the Snowflake Mine sites (BLM-administered lands) were withdrawn from consideration by request of the State of Arizona, the BLM Arizona Strip Field Office, and the BLM Arizona State Office after review of the Draft EIS. These sites are not included as a REDA or in the analysis.

Comments:

Submission No: RDEP-Drft-0046

Commenter: David Grieshop

Comment: Siting. The Tombstone landfill (a brownfield site) is a good reuse opportunity for the land. (I lead a brownfield conversion of an abandoned tobacco processing plant into a city farmer's market and small condo development in NC in late 1990s.) The downside is the transmission connection distance to existing high voltage cut in when using a brownfield site. Power cut-in to existing high voltage capacity is always an issue; especially gaining right of ways.

Submission No: RDEP-Drft-0005

Commenter: Katherine Gensler, Solar Energy Industries Association

Comment: Other previous uses, though, pose more of a challenge. Brownfields, abandoned mines and any site requiring remediation prior to development require significantly more time, expertise and financial resources on the developer's part. Resolution of liability issues alone could take years and significant attorney fees. There is scant evidence to show that today's solar developers have the necessary resources or inclination to undertake such a development. Indeed, EPA's RE-Powering America program, which aims to redevelop contaminated or brownfield sites with renewable energy, only highlights solar success stories on former landfills, not on any brownfields.

Submission No: RDEP-Drft-0064
Commenter: Jerry Stabley, Pinal County Planning and Development
Comment: #7 Brady Central CAP
This site is shown in our [Pinal County] Comprehensive Plan as part of a planned Regional Park. This planned park is focused on preserving the Picacho Mountains, and extends from this site south to Interstate 10. My understanding of this site, and site #45, was that they were to act as retention basins for surface water flowing towards the CAP. If these sites do have that purpose, how do the basins work with the solar facilities?

Submission No: RDEP-Drft-0064
Commenter: Jerry Stabley, Pinal County Planning and Development
Comment: #8 Brady Wash Pipeline
The [Pinal County] Comprehensive Plan shows an open space wildlife corridor in Section 17 of this site. From the aerial photographs, it appears that Section 22 of this site may have some difficult terrain issues.

Submission No: RDEP-Drft-0064
Commenter: Jerry Stabley, Pinal County Planning and Development
Comment: #19 Empire Farms
This site is immediately adjacent to developed residential areas in San Tan Valley, which is the largest community in Pinal County. This site, in combination with other adjacent State Lands, has been mentioned as a location for a town center for the community. There are other State Land parcels in this vicinity which could accommodate solar energy development and do not have the near term potential for urban development that Empire Farms has.

Submission No: RDEP-Drft-0061
Commenter: Alexander B. Smith, Bureau of Reclamation, Environmental Resource Management Division
Comment: Figure 1-3 and Section 7 of the DEIS identify 5 Nominated Sites (sites 2, 27, 31, 45, and 60) located within the right-of-way of the Central Arizona Project (CAP). The CAP is owned by Reclamation and operated by the Central Arizona Water Conservation District pursuant to an Operating Agreement between the two parties. Exhibit B-1 to that Operating Agreement sets forth the policy for management of areas along the upslope embankment of the CAP canal, which are collectively referred to as "mitigation lands." Those mitigation lands constitute a significant portion of the CAP sites identified in the DEIS. Mitigation lands (also referred to as "green-up" areas) were set aside to compensate for the destruction of wildlife habitat and disruption of cross drainage that resulted from construction of the CAP. According to the Reclamation policy, mitigation lands can be used for low-impact purposes provided those purposes do not cause wildlife disturbances or habitat alteration. Lands within the mitigation areas may be considered for other project resource management purposes only if appropriate mitigation measures are implemented. Full replacement or enhancement of existing habitat values would be required by Reclamation for loss of habitat within these areas. It is assumed that all mitigation costs would be the responsibility of the project proponent.

Submission No: RDEP-Drft-0066
Commenter: John Wessels, National Park Service
Comment: The site [#17] is within the Mojave Desert which comprises only a small portion of the acreage within the State of Arizona. The Detrital Wash is the prominent feature of the area and is a large ephemeral wash that extends approximately 25 miles in a general north-south direction and ends at the shoreline of Lake Mead. Washes are extremely important features in the Mojave Desert because they provide vertical structure and cover not present in areas outside of washes. The Mojave Desert is characterized by low shrub lands with Creosote bush (Larrea tridentata) and Burrobush (Ambrosia dumosa) as dominant perennial plants. Each of these plants is less than 4feet in height so there is not much structure to the general Mojave Desert landscape. With the low profile of the vegetation, the natural geologic features dominate the landscape.

The area surrounding Detrital Wash is typical Mojave Desert with low density shrubs but the bajadas show little impact of man and have a high degree of integrity. There are two parallel power lines and a meandering gravel road but otherwise there is little evidence of man and man's activities in this area. The area is in remarkable condition and that condition should be maintained. The majority of the Federal land ownership in this general area is checker boarded and difficult to manage. The area in and around Detrital Wash, which is in consolidated Federal ownership, could be managed as an alternative to the rapidly developing lands of the greater area.

Submission No: RDEP-Drft-0066
Commenter: John Wessels, National Park Service
Comment: As a cooperating agency in the preparation of the Draft Environmental Impact Statement for the Mohave Wind Energy Project proposed to be located in this general area, we continue to have concern with BLM's low quality characterization of the local viewshed. We contend the area is valuable for its visual resources and solar development will compromise this valued resource. We also disagree with BLM's conclusion that these lands have been subject to previous disturbance.

Submission No: RDEP-Drft-0007
Commenter: Greta Anderson, Western Watersheds Project
The Hartman Wash Mine (site #29) in Maricopa County is a tributary of the Hassayampa River. The aerial image that accompanies the nominated site summary differs greatly from aerial images that can be found online. This wash is a major migratory corridor and should be withdrawn from future consideration. Category: Nominated sites Sub-category Re-evaluating sites

Submission No: RDEP-Drft-0007
Commenter: Greta Anderson, Western Watersheds Project
Comment: The Bouse Hills CAP site (site #6) is within or adjacent to the Plomosa Special Recreation Management Zone (RMZ-3, Bouse Plain), which is to be managed for allowing visitors to appreciate the natural setting and for minimal development. Lake Havasu ROD ARMP 2007 at 94. Invasive species, including Sahara mustard (Brassica tournefortii), are an issue in this area. Impacts to the Little Harquahala Herd Area should also be considered and mitigation.

Submission No: RDEP-Drft-0007
Commenter: Greta Anderson, Western Watersheds Project
Comment: The Brady Wash Pipeline site (Site #8) is inappropriate for future consideration because of the special status species' habitats that occur there. We agree with the scoring that gives this a low potential based on sensitive resources and land management concerns. DEIS at 4-5. It is not clear why this site is referred to as a "pipeline," and the site description contains insufficient detail if this area has already been impacted by utility development.

Submission No: RDEP-Drft-0007
Commenter: Greta Anderson, Western Watersheds Project
Comment: It is unclear why the Chevron Vacant Land site (site #12) was included as a REDA. It has important environmental resources including desert tortoise habitat and big game habitat. The RDEP states that this has been identified for disposal, but the plan in which those decisions were made is very old. It is far from a graded road, and upgrading the site for industrial energy use would require a much larger footprint of impacts than the site itself. It is surrounded by undeveloped land and should be withdrawn as a REDA. Its weighted score is low (DEIS at 4-5) and it should not be considered further.

Submission No: RDEP-Drft-0064
Commenter: Jerry Stabley, Pinal County Planning and Development
Comment: #12 Chevron Vacant Land
This location on the coalesced alluvial fans from Black Mountain could lead to some drainage issues and will probably make this site highly visible from Hwy 79. During the development of our [Pinal County] Comprehensive Plan, many people in the

County expressed as strong interest in protecting views from the highway. A very large solar field could cause strong public concerns.

Submission No: RDEP-Drft-0007
Commenter: Greta Anderson, Western Watersheds Project
Comment: A 2007 Rapid Watershed Assessment of the Detrital Wash Watershed (Available online: nemo.srnr.arizona.edu) identifies resource concerns including erosion, excessive runoff, water quality issues, plant condition, and rangeland site stability as issues in the watershed. There is true riparian vegetation in the watershed that could be affected if the Detrital Wash REDA (site #18) is developed.
There are nine federally listed species in the Detrital Wash Watershed, and while the DEIS acknowledges that 35 percent of the REDA site is special status species habitat, it does not identify the species or discuss impacts to species in the region. The DEIS does not describe whether any of the species of concern are found within the REDA. With such a high ecological significance, the REDA should be withdrawn. The RWA identifies development in the Detrital Wash as a resource concern; certainly expanded suburban development should be analyzed as a cumulative impact of any energy development. The relatively high weighted score of the REDA within the RDEP is unfortunate and we suspect that comes from an insufficiently hard look at the sensitive resources and land management concerns in the proposal ranking. DEIS at 4-5.

Submission No: RDEP-Drft-0007
Commenter: Greta Anderson, Western Watersheds Project
Comment: The Ryland REDA (site #47) is inappropriate for further consideration because of its potential to support wetlands. Nearly ¼ of the site has the potential for wetland habitat, and the remaining area of the site should be saved as a buffer on this important habitat. It has a high conservation potential and that should eliminate it from the RDEP. It is also unclear how the RDEP's "Ryland" site overlaps with the Ryland Landfill site that has been selected as a test site for a federal project to assess the feasibility of putting solar sites on landfills. See http://bit.ly/AcUMR6/.

Submission No: RDEP-Drft-0002
Commenter: Maria Baier, Arizona State Land Department
Comment: The ASLD also requests that you delete the Butler Valley and Empire Farms nominated sites from the Final EIS due to higher value uses than renewable energy for these sites.

G.2.14 Off-Highway Vehicles Impact Analysis

Summary:

The BLM needs to improve the cumulative impact analysis in the OHV section to account for pushing recreationists into other areas if an OHV disturbed location is converted to a REDA.

Response:

The Fredonia OHV Area has been withdrawn from consideration at the request of the BLM Arizona Strip Field Office.

Comments:

Submission No: RDEP-Drft-0007
Commenter: Greta Anderson, Western Watersheds Project
Comments: We don't object to energy development in areas that have already been significantly degraded by off-highway vehicle use and which meet other criteria for responsible energy development. However, we are concerned by the Fredonia OHV Area REDA (site #24) because of the potential for energy development at this site to displace ORV impacts to new locations in the Arizona Strip. Because the Arizona Strip BLM doesn't monitor or enforce ORV restrictions, we fear that restricting use on an existing play area would have cumulative

impacts for the surrounding landscape that the BLM isn't addressing in the DEIS. Illegal road construction takes a single initial pass through desert lands and then other riders simply follow the two-track. BLM has not sufficiently analyzed the displacement of these impacts from the REDA to other fragile areas within the field office. The RDEP's stated intention is to limit new disturbance; by placing known recreational sites off-limits, BLM is ensuring new disturbance will occur.

G.2.15 Other Plans

Summary:

The BLM needs to better explain state and local jurisdiction responsibilities resulting from the RDEP.

Response:

Decisions made in the RDEP Record of Decision will apply only to BLM-administered lands. The analysis was conducted statewide regardless of land status to facilitate statewide planning and identify areas for possible partnering between the BLM and other federal or state agencies and private land owners. There is no requirement for local jurisdictions to implement the decisions of RDEP.

Comments:

Submission No: RDEP-Drft-0058

Commenter: Buster Johnson, Mohave County Board of Supervisors

Comment: Generally, statements are made throughout the document that contend that certain protections must be, or should be in place, to safeguard various aspects of a quality-of-living nature, for taxpayers and residents closest to proposed renewable energy proposals. To what extent are these assertions, made by the BLM (who only has direct jurisdiction over BLM properties) incumbent on local jurisdictions to implement? Is the County expected to enforce provisions of this document?

G.2.16 Consistency with other BLM Planning Efforts

Summary:

The RDEP decisions need to be revised to be consistent with the Lower Sonoran RMP.

Response:

The RDEP was conceived as a statewide initiative that would identify renewable energy development areas and would update most of the RMPs in Arizona. The Draft EIS explains that several RMPs, including the Lower Sonoran RMP, would be amended with the decisions made as part of the RDEP (see Section 1.5.1, Decisions on the REDA). As the commenter notes, the Lower Sonoran RMP/EIS process was at the Draft EIS stage when the RDEP's Draft EIS was released for public comment. The Lower Sonoran Draft RMP/EIS was refined and modified to become the Proposed RMP/Final EIS, and the Record of Decision was signed on September 14, 2012. Based on the new decisions in the Lower Sonoran ROD, BLM updated the GIS datasets and eliminated from consideration the new SRMA, ACEC, and VRM III areas, resulting in an acreage changes under each alternative (see **Chapter 2**, Alternatives, for the acreage amounts). Once the RDEP ROD is signed, however, its decisions will amend the Lower Sonoran ROD as noted in **Section 1.5.1**, Decisions on Renewable Energy Management and the REDAs.

Comments:

Submission No: RDEP-Drft-0024

Commenter: Steve Saway

Comment: However, I am concerned that the RDEP's definition of lands with low resource sensitivity is problematic. It appears from the RDEP

Draft EIS maps that these lands include portions of the Lower Sonoran Field Office that were designated in the Draft Lower Sonoran Resource Management Plan (RMP) as "High and Moderate Sensitivity Areas" under the category of "Utility Scale Renewable Energy Development Avoidance Areas" (see Map 2-7e in the Lower Sonoran Draft RMP). Recommend the RDEP Draft EIS be revised as needed to be consistent with the Draft Lower Sonoran RMP.

G.2.17 Planning

Agency Coordination

<u>Summary:</u>

The BLM needs to coordinate more with Pima County.

<u>Response:</u>

The BLM worked closely with cooperating agencies and county governments including meetings with Pima County, in developing the Draft PEIS. with counties and local agencies throughout the remainder of the RDEP analysis process.

<u>Comments:</u>

Submission No: RDEP-Drft-0022

Commenter: Elizabeth Webb

Comment: A. Would prefer to see more tangible participation from Pima County in further analysis before the FEIS is released; particularly in regard to the Sonoran Desert Conservation Plan. IE; working papers, PC renewable energy policy, and specific comments regarding the “nominated sites” from Pima County. B. Concern about county level involvement is not limited to Pima County. C. Would prefer to see more active solicitation of input from specific, local non-governmental organizations dedicated to community and environmental protection prior to issuance of FEIS. Pima County has a list of registered neighborhood associations available on its GIS mapguide but this comment is not limited to just Pima County

Evaluation Process

<u>Summary:</u>

The BLM needs to ensure a process for updating and evaluating data used in the analysis.

<u>Response:</u>

BLM planning policy requires evaluation of planning decisions every five years (see BLM Land Use Planning Handbook, H-1601-1, pg. 33). As RDEP’s Record of Decision is expected to provide new planning decisions for several Arizona BLM land use plans, these decisions would be reviewed as part of this required plan evaluation process. The decisions would be evaluated to determine:

- If decisions remain relevant to current issues
- If decisions are effective in achieving (or making progress toward achieving) desired outcomes
- If any decisions need to be revised
- If any decisions need to be dropped from further consideration
- If any areas require new decisions.

In making the determination, the BLM would consider whether mitigation measures included with the RDEP decisions are satisfactory, whether there are significant changes in the related plans of other

entities, and whether there is new data of significance that should be considered. The REDA screening tool is dynamic to respond to changing resource conditions and data.

Comments:

Submission No: RDEP-Drft-0033
Commenter: Jeanie Watkins
Comment: REDA lands should be evaluated every five years utilizing the best available data and new screening criteria as it becomes available.

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: Screening Process: The screening process should be updated and implemented on a regular basis, utilizing the best available science and most recent data (such as WECC's Environmental Data Task Force). Many of the screens are based on data that is constantly being updated and refined. RDEP should update its screening process and evaluations of REDAs every five years, at a minimum

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Screening Process: The screening process should be updated and implemented on a regular basis, utilizing the best available science and most recent data (such as data from WECC's Environmental Data Task Force and Arizona Game and Fish Department's Statewide Wildlife Action Plan and Wildlife Linkage modeling data). Many of the screens are based on data that is constantly being updated and refined. RDEP should update its screening process and evaluations of REDAs every five years, at a minimum.

Submission No: RDEP-Drft-0003
Commenter: Amanda Ormond, Interwest Energy Alliance
Comment: Recommendation 5 – Process for Updating Data
BLM has used an extensive number of data sets to identify REDA lands. Some of these data are constantly being revised. BLM needs to implement a process that will allow the RDEP/REDA to be reviewed and updated to incorporate current data so the project does not stagnant or rely on out-of-date data.
Interwest recommends that BLM establish a schedule for reviewing and updating the information and dedicate the resources to accomplish the update. We recommend an updating of information a minimum of every five years.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Recommendation: Consistent with the timeline proposed in the Supplement for the Solar PEIS for the consideration of new SEZs, ASWG recommends that the RDEP process in Arizona, and other states should it serve as the model, should be updated by the BLM at a minimum every five years. We agree, as outlined in the Supplement, that outside petitioners may submit requests to update the RDEP process at an earlier time based on key criteria that should be outlined in the Final EIS.

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: We also reiterate the importance of regularly revisiting and updating the RDEP analyses in terms of their impacts on wildlife and resources. We believe that a five year review period would be reasonable and effective.
Recommendation: BLM should review the RDEP analyses every five years, incorporating new data into all of the screens and potentially adding new REDAs or nominated sites and removing any that can no longer be considered "low resource sensitivity".

Submission No: RDEP-Drft-0031
Commenter: Kathy Lopez
Comment: REDA lands should be reevaluated every five years utilizing the best available data and new screening criteria as it becomes available.

Public meetings

Summary:

The BLM failed to adequately announce the public meetings and should plan meetings in the communities most likely to be impacted by the decisions.

Response:

The BLM has made extensive opportunities for involvement and comment available to the public throughout the NEPA process for the RDEP EIS. A project website for the public was made available at the beginning of the project to make relevant project information available. The agencies conducted initial scoping from January 13, 2010, through March 11, 2010, during which time members of the public could comment on the scope and objectives of the RDEP through the project e-mail address, by mail, or in person at public meetings. In addition to the Notice of Intent, the BLM notified the public of the RDEP and the associated scoping period through media outlets, postcards, e-mails, and the RDEP website. Public meetings were held at 10 locations between February 8, 2010, and February 25, 2010. The scoping meetings gave the public an opportunity to learn and ask questions about the RDEP, to submit their site proposals, and to share issues and concerns with the BLM. The BLM chose an open-house meeting format to encourage broader participation, to allow attendees to learn about the RDEP at their own pace, and to enable attendees to ask BLM representatives questions in an informal one-on-one setting. In addition, the BLM provided a 25-minute presentation at each meeting about the RDEP and the public's role in the scoping process. The BLM has also provided presentations at conferences and to groups upon request.

After publication of the RDEP Draft EIS, there was a 90-day comment period; five public meetings were held in Yuma, Phoenix, Kingman, Flagstaff, and Tucson. Press releases where distributed to local media outlets, including radio, television stations, and newspapers. Over 3,000 project newsletters were mailed out to people that had expressed interest in the project, and notices were provided to stakeholder groups and all cooperating agencies. The project website hosted all meeting information along with the Draft EIS document and contact information.

Comments:

Submission No: RDEP-Drft-0022
Commenter: Elizabeth Webb
Comment: G. Public meetings may be more effective if held in the communities that would be more likely to be impacted by the RDEP. (impacted both positively and negatively). Most smaller communities have schools or fire stations with meeting rooms at possibly lower costs than a commercial hotel.

Submission No: RDEP-Drft-0057
Commenter: Robert Zittle
Comment: First and foremost the BLM failed to properly and adequately announce this meeting to the general public. The BLM could have advertised this meeting through the local TV, Radio Stations and newspapers. The local TV and Radio stations provide free public service announcements. Had this meeting been properly advertised and had it been scheduled just three weeks earlier when many of our local winter visitors were still in the area, the BLM could have filled the entire room with concerned citizens. The BLM knew in advance that they did not properly advertise the event because they only set out less than 50 chairs for the public meeting, expecting a very small population of people to attend.

Submission No: RDEP-drft-0057
Commenter: Robert Zittle

Comment: Posting the Notice on the BLM website, should not be an authorized means of notifying the public because many people do not even have access to computers and most of those who do have access to computers do not normally wake up in the morning saying gee I'd better check the BLM website for notices. The BLM failed to properly notify the public about this meeting.

G.2.18 Multiple Uses

Summary:

The BLM needs to clarify if there could be multiple concurrent uses within REDAs or if REDAs are for the exclusive use of renewable energy developments.

Responses:

All REDAs would remain available for multiple uses. However, once an application is accepted for consideration, the BLM will prioritize renewable energy development in REDAs. Other uses could still occur as appropriate for the activities and public health and safety.

Comments:

Submission No: RDEP-Drft-0058

Commenter: Buster Johnson, Mohave County Board of Supervisors

Comment: Generally, does a BLM approval of a renewable energy project, whether it be a series of wind turbines, or a field of solar arrays, preclude, limit or otherwise alter the existing rights of the public to use that same property (simultaneously) for purposes such as hiking, camping, hunting, cattle or sheep grazing, etc.? Is the developed property allowed to be fenced in a way that would keep out the public, and effectively precluding those uses? The public would likely be concerned about trading their open spaces and recreational uses for power production. One asset would apparently be exchanged for another. Preclusion of public uses on lands consumed by renewable energy projects seems to be an issue of genuine concern. Is there any intention to address this issue, to allow more uses simultaneously? Perhaps fencing of facility perimeters can be prohibited as a term of approval for BLM leases for these types of projects.

G.2.19 Purpose-Need

Include Tribal Lands

Summary:

The RDEP should include consideration of tribal lands in the scope of the analysis.

Response:

BLM initiated consultation with affected tribes early in the RDEP development process. As a matter of practice, the BLM coordinates with all tribal governments, associated native communities, native organizations, and tribal individuals whose interests might be directly and substantially affected by activities on public lands. As tribes are sovereign nations, the BLM only considered requests for consultation and inclusion of tribal lands through federally recognized tribal governments and agencies. During consultation, tribes identified their interests and concerns in regard to developing renewable energy projects on tribal lands, adjacent lands, and traditional territories, and highlighted a desire to better understand the nature, benefits, costs, and environmental impacts of various technologies. However, the tribes did not become formal cooperating agencies, did not express an interest for BLM to include tribal lands as part of the planning and analysis area, and, apart from one exception, no tribe submitted nominated sites for consideration as part of RDEP. As a result, tribal lands were not included in the RDEP planning area or the analysis area.

The BLM is committed to ongoing consultation with tribes after RDEP; the BLM would be able to provide information and analysis to help inform tribal governments and agencies, and serve as a resource for the tribal members, policy makers, and energy planners that are considering renewable energy projects on their lands. This could include providing the screening criteria (the resources noted in Table 2-1) used to define REDAs to tribes to use if they would like to do a similar screening process on their lands.

Comments:

Submission No: RDEP-Drft-0020

Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes

Comment: Further, Arizona tribes may well be interested in siting projects on Tribal lands. Excluding tribal lands from consideration under the RDEP places additional pressure on developers and BLM to squeeze every available acre for project siting. This pressure may be alleviated, and thus, significant cultural, historic, and sacred sites spared the plow, if tribal lands comprise a share of the available land pool.

The DEIS Executive Summary states that one goal of BLM's mission is to "[b]e effective stewards of heritage resources by engaging [in] government-to-government consultation with tribal governments and thoroughly considering cultural resources in environmental analysis." DEIS ES-5.CRIT believes that part of that analysis should include an assessment of how tribal lands might factor into the total-land-requirement equation, provided that tribes are interested in and consulted on such an assessment.

Submission No: RDEP-Drft-0060

Commenter: Beth Rivers, Indigenous Support Coalition of Oregon

Comment: My recommendation follows input from Dine'h who have long sought solar development at Black Mesa following the Interior's installation of coal facilities leading to heavy reliance on carbon-based fuels in the region.

Submission No: RDEP-Drft-0060

Commenter: Beth Rivers, Indigenous Support Coalition of Oregon

Comment: Arizona's BLM DEIS states that the EIS will provide "tribal governments…with a better understanding of the environmental and economic issues associated with developing renewable energy in Arizona" (ES-7 to ES-8) and repeats the usefulness to "tribes" throughout, yet no Indian lands are included for BLM "blueprint" analysis (Table ES-2).

Submission No: RDEP-Drft-0060

Commenter: Beth Rivers, Indigenous Support Coalition of Oregon

Comment: The DEIS Executive Summary states "goals of the Energy Strategy include…to develop renewable energy strategies for all of Arizona" (ES-5) and yet every state map in the RDEP DEIS shows a neglected region in the northeast corner where both the Hopi and Navajo reservations are, where the Black Mesa Complex connects to the Navajo Generating Station and a power transmission grid delivers coal combustion electricity to Nevada, California and Arizona. Roughly one quarter of each Arizona map is shown as blank!

Submission No: RDEP-Drft-0060

Commenter: Beth Rivers, Indigenous Support Coalition of Oregon

Comment: And so, any review of public lands for analysis of renewable energy suitability needs to include a review of Indian lands that are "previously disturbed" such as reclaimed mine lots, especially when the review is done by DOI agencies. Additionally, the exclusion of Indian lands as a category from lands that Arizona BLM analyzes is unfair and goes against both the spirit and the letter of your regulations, codes, guides and strategic plans used by the BLM and DOI in developing proposals and Environmental Impact Statements.

Submission No: RDEP-Drft-0060
Commenter: Beth Rivers, Indigenous Support Coalition of Oregon
Comment: Reclaimed lots in the Black Mesa Complex and the "abandoned" Black Mesa Mine, which was closed due to environmental concerns and lack of a coal customer (after the Mohave Generating Station closed), should be seriously considered for RDEP analysis and solar development funded by DOI. "A key component of the RDEP is emphasizing the reuse of previously disturbed or developed lands that, after remediation or site preparation, may be suitable for renewable energy development" states the BLM DEIS Disturbed Lands and Nominated Parcels section (ES-6). Now that CO2 and other greenhouse gas emissions are coming under regulation federally and internationally, a conversion desired by the tribal peoples away from coal dependency and toward solar is due on the reclaimed leasehold.

Private Lands

Summary:

The BLM needs to clarify why private lands are included in RDEP.

Response:

The RDEP planning area includes all lands regardless of jurisdiction; however, the BLM would make decisions only on lands that fall under its jurisdiction (EIS page 3-1). While decisions made from the EIS would apply only to BLM-administered lands, the analysis was conducted statewide regardless of land status to facilitate statewide planning and to identify areas for possible partnering with the BLM and other federal or state agencies, and private landowners (EIS page 2-3).

Comments:

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: The EIS clearly makes a distinction between lands under BLM authority, and those that are not. Numerous exhibits identify sites, within BLM authority that are likely candidates for placement of renewable energy facilities. Other exhibits counter this by identifying all the many reasons that some of those likely areas are not really likely after all. It is understandable that the BLM would have this much authority over lands it administers. But the EIS also appears to do the same with private lands, although in a more subtle way. What is the intent in this regard?

Submission No: RDEP-Drft-0058
Commenter: Buster Johnson, Mohave County Board of Supervisors
Comment: Mohave County administers a General Plan county wide, and it has zoning and permitting authority over county unincorporated areas, so it has considerable interest in where renewable energy proposals are to be located. Projects proposed in the county, even on private land, appear to be evaluated by the BLM (through inter-agency courtesy reviews) on the same basis as if the sites were BLM-administered. Given the "checkerboard" nature of the distribution of private and public lands in Mohave County, the BLM's approach to decision making on public lands will substantially affect how it reviews private-land proposals. Accordingly, the BLM program should not be viewed as being limited to BLM lands only.

Site-Specific Analysis

Summary:

The BLM needs to be more specific in how site-specific analysis will be conducted.

Response:
Applications for proposed solar and wind energy development projects are processed as ROWs under Title V of FLPMA and Title 43, Part 2800, of the Code of Federal Regulations. The processing of solar and wind energy development ROW applications must comply with the BLM's planning, environmental, and ROW regulatory requirements. When the BLM considers a proposal submitted by others, the BLM decision maker must determine if it would conform with the applicable land use plan (43 CFR, 1610.5-3, 516 BM 11.5) and what level or type of environmental documentation is required.

The BLM will conduct subsequent NEPA analyses for site-specific project and implementation level actions for proposed renewable energy development (Section 1.5.3). These subsequent NEPA analyses would follow all CEQ and BLM NEPA policy and guidance (see 40 CFR, Sections 1502.20 and 1508.28, and the BLM NEPA Handbook, H-1710-1), tier to the RDEP analysis, and would evaluate project impacts based on the unique design elements and location of the proposal. The public would be offered the opportunity to participate in the NEPA process for these specific implementation actions as required by NEPA.

Comments:
Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: We recommend the following specific changes and provisions regarding further NEPA analysis for project applications. The Final EIS should provide guidance on issues to be developed in NEPA analysis for specific solar applications within a REDA, whether in an EA or EIS, including: Identifying specific elements of analysis – simply stating (as the DEIS does) that "This EIS will not eliminate the need for site-specific environmental review for future individual renewable energy development proposals;…" (DEIS, p. 1-13) is not sufficient guidance. The Final EIS should require that analysis of individual applications will address, at a minimum, features and resources of the actual location, technology, a reasonable range of alternatives, plan of development, cumulative impacts for affected landscape, and mitigation measures, and provide opportunities for public comment through scoping, preliminary alternatives, and draft NEPA document; Specifying that robust public involvement is required, including requiring a comment period, even if using an EA, and emphasizing the benefits of early and ongoing public involvement, such as through providing preliminary alternatives for public comment; Requiring cumulative impact analysis to address ongoing projects and stressors in the project area that cannot be accomplished through tiering; and Clarifying BLM's authority to deny applications. We strongly support the BLM reiterating that the agency "retains the discretion to deny solar and wind ROW applications based on site-specific issues and concerns, even in those areas available or open for application in the existing land use plan" (DEIS, p. ES-7). We would also recommend that the BLM clarify that its discretion can be applied to deny applications without conducting in-depth environmental analysis.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: The Final EIS should provide guidance on issues to be developed in NEPA analysis for specific solar applications within a REDA, whether in an EA or EIS, including:
Identifying specific elements of analysis – simply stating (as the DEIS does) that "This EIS will not eliminate the need for site-specific environmental review for future individual renewable energy development proposals…" (DEIS, p. 1-13) is not sufficient guidance. The Final EIS should require that analysis of individual applications will address, at a minimum, features and resources of the actual location, technology, a reasonable range of alternatives, plan of development, cumulative impacts for affected landscape, and mitigation measures, and

provide opportunities for public comment through scoping, preliminary alternatives, and draft NEPA document;

G.2.20 National Park Service Areas in Variance Lands in the Solar Final PEIS

Summary:

The commenter requests that the RDEP run the REDA alternatives again in order to include the new National Park Service areas defined in the Solar Final PEIS.

Response:

The BLM appreciates the importance of the setting, character, and resources of National Park System lands. How these lands could be impacted by renewable energy development is very dependent upon the proposed technology and site characteristics (e.g., topography, vegetation, wind direction, viewshed, wildlife corridors, and habitat). Therefore at the planning level it is difficult to conduct such site-specific analysis. To avoid conflicts with National Park System lands, the following management action has been added to the Final EIS in Chapter 2, Alternatives. It applies to all action alternatives and is consistent with direction in the Solar PEIS (BLM and DOE 2012).

Where a wind or solar energy development ROW application is submitted in a REDA that is in an areas identified by the National Park Service as having a high potential for conflict with the resources of a unit of the National Park Service or special areas administered by the National Park Service, additional documentation will be required. This documentation may include information to verify any or all of the following potential resource conditions resulting from the proposed project:

- Increased loading of fine particulates (criteria pollutants: PM 2.5 and PM10 [particulate matter with a diameter of 2.5 µm or less and 10 µm or less, respectively]) and reduced visibility in Class I and sensitive Class II areas;
- Vulnerability of sensitive cultural sites and landscapes, loss of historical interpretative value due to destruction or vandalism;
- Altered frequency and magnitude of floods, and water quantity and quality;
- Reduced habitat quality and integrity and wildlife movement and/or migration corridors; increased isolation and mortality of key species;
- Fragmentation of natural landscapes;
- Diminished wilderness, scenic viewsheds, and night sky values on landscapes within and beyond boundaries of areas administered by the NPS; and
- Diminished cultural landscape qualities within and beyond boundaries administered by the NPS.

Comments:

Submission No: RDEP-Drft-0066

Commenter: John Wessels, National Park Service

Comment: Although we realize that BLM used different screening processes to select lands for potential renewable energy development in Arizona, NPS asks for the following in the RDEP-EIS: 1) Reassess the footprint of the potential development lands based upon as yet undefined or finalized land exclusion decisions from the Solar PEIS, 2) RDEP-EIS lands proposed for development that are in proximity to NPS units should be excluded from consideration until decisions on land exclusions and resource protection criteria are finalized in the Solar PEIS, and 3) clarify within the RDEP-EIS whether the decision resulting from this plan will further refine the footprint of solar energy program lands in Arizona as described in the Final Solar PEIS.

G.2.21 Variance Process

Summary:

The BLM needs to clarify how the RDEP relates to the variance process, as described in the Solar PEIS Supplement.

Response:

The proposed variance areas and associated variance process described in the Solar Final PEIS would apply only to utility-scale solar development. Under RDEP, REDAs may fulfill many elements of the national solar program's variance process. For a solar energy project that is not utility scale, including distributed generation, it would follow the RDEP requirements (such as application of design features) and any existing management prescriptions in BLM land use plans. Both utility-scale and smaller scale renewable energy projects that require a ROW from the BLM would be subject to individual site-specific NEPA analyses.

Utility-scale solar development project applications could be submitted in variance areas not identified as REDAs; however, the BLM would consider these ROW applications for utility-scale solar energy development on a case-by-case basis based on environmental considerations, in coordination with appropriate federal, state, and local agencies, and tribes, and public outreach. Demonstrating to the BLM and other coordinating parties that a proposal in a variance area would avoid, minimize, or mitigate, as necessary, sensitive resources would be the responsibility of the applicant. Based on a thorough evaluation of the information provided by an applicant, and the input of federal, state, and local government agencies, tribes, and the public, the BLM would determine whether it is appropriate to continue to process or to deny a ROW application submitted through the variance process.

Comments:

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: Finally, the Supplement to the Solar PEIS notes that all variance applications that are determined to be appropriate for continued processing will be submitted by the State Director to the BLM Washington Office for the Director's concurrence (Supplement, p. 2-40). We question whether this would be necessary for applications in REDAs.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Finally, the Supplement to the Solar PEIS notes that all variance applications that are determined to be appropriate for continued processing will be submitted by the State Director to the BLM Washington Office for the Director's concurrence (Supplement, p. 2-40). We question whether this would be necessary for applications in REDAs.

G.2.22 Reasonably Foreseeable Development Scenario

Calculations

Summary:

The BLM needs to revise the RFDS to reflect more accurate calculations.

Response:

Calculations for the RFDS were developed by identifying lands using screening criteria developed in the ARRTIS project (Southwest Area Transmission Planning Group 2009), the 2007 Arizona Wind Energy

Assessment (Arizona Wind Working Group 2007), and the Solar Energy Development Programmatic EIS (BLM 2010). Based on the calculations from the GIS screening process, the acreage was then divided by an industry-standard factor of generation capacity per acre, resulting in an estimate of solar electricity generation capacity for both the entire state and BLM-administered lands in the state. Estimates in the RFDS represent the potential if land were fully developed; the BLM recognizes that development could occur at a lower level due to other constraints. The RFDS is intended to support the analysis in the EIS and would not be used directly in decision making.

Comments:

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: Acres of BLM Lands Needed to Support 1 MW Solar Development: The calculations in Appendix A implicitly assume that 100% of the BLM lands that are potentially developable and have solar potential could be developed at the assumed rate of eight acres to one megawatt. However, it is unrealistic to assume that all of the BLM acres identified as priority areas for solar would actually be suitable for development, and that projects would be sited so closely together as to make use of every acre of land. It would be more appropriate to assume that the amount of BLM land needed to develop one megawatt of solar include a buffer of 20% that does not actually host projects, but represent areas between projects or are lands that are otherwise inappropriate for development. So for example, of every 10 acres of BLM lands designated as preferred for solar development, only eight of those acres would be developed at the assumed acres per megawatt rate.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Acres of BLM Lands Needed to Support 1 MW Solar Development: The calculations in Appendix A implicitly assume that 100% of the BLM lands that are potentially developable and have solar potential could be developed at the assumed rate of eight acres to one megawatt. However, it is unrealistic to assume that all of the BLM acres identified as priority areas for solar would actually be suitable for development, and that projects would be sited so closely together as to make use of every acre of land. It would be more appropriate to assume that the amount of BLM land needed to develop one megawatt of solar include a buffer of 20% that does not actually host projects, but represent areas between projects or lands that are otherwise inappropriate for development. So for example, of every 10 acres of BLM lands designated as preferred for solar development, only eight of those acres would be developed at the assumed acres per megawatt rate.

Decision Making

Summary:

The BLM needs to clarify how the RFDS calculations relate to REDAs and to the BLM's decision making.

Response:

As stated in Section 2.6, Summary of the Reasonably Foreseeable Development Scenario, the RFDS is neither a planning decision nor the No Action Alternative in the EIS; rather, it serves as a technical supporting analytical document intended to be used as a reference. The RFDS would not specifically be used in BLM decision making. The purpose of the RFDS was to determine the anticipated level of development and acres required to satisfy these development needs in order that the appropriate area and scale of development could be analyzed in the EIS. The RFD provides an upper bound for the analysis and is typically designed to represent the maximum development scenario; as such, the RFDS serves as a supporting tool in the NEPA process rather than a stand-alone document that would dictate

BLM policy or decisions. The BLM recognizes that the RFDS estimate represents current conditions only and is likely to become outdated as renewable portfolio standards, energy demand, and other factors change the level of renewable energy required in the state. The RFDS will not be updated in light of newly available information, although this information could be used in the decision making process for site-specific projects. Information has been added to the document in Chapter 2, Alternatives, to clarify the role of the RFDS in the planning process.

Comments:

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: In addition to revising the above-noted assumptions, the DEIS should clarify how the Reasonably Foreseeable Development Scenario (RFDS) will be used by BLM decisionmakers in the context of solar projects proposed on BLM lands. On pages 2 and 3 of Appendix A, the DEIS notes that the RFDS is intended to provide policy makers, decision makers, the public, and developers with information on the overall solar potential in the state and on BLM lands, and on areas most suitable for development. However, it is not clear how RFDS-calculated results are intended to impact an eventual decision on the DEIS' Preferred Alternative, or how otherwise the results are intended to be used in the context of RDEP or other BLM decisions.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Recommendation: In addition to revising the above-noted assumptions, the DEIS should clarify how the Reasonably Foreseeable Development Scenario (RFDS) will be used by BLM decisionmakers in the context of solar projects proposed on BLM lands. On pages 2-3 of Appendix A, the DEIS notes that the RFDS is intended to provide policy makers, decision makers, the public, and developers with information on the overall solar potential in the state and on BLM lands, and on areas most suitable for development. However, it is not clear how RFDS-calculated results are intended to impact an eventual decision on the DEIS' Preferred Alternative, or how otherwise the results are intended to be used in the context of RDEP or other BLM decisions.

Submission No: RDEP-Drft-0003
Commenter: Amanda Ormond, Interwest Energy Alliance
Comment: Recommendation 9 – Reasonably Foreseeable Development Scenario (RFDS)
BLM has a section on RFDS. It is understood that the BLM developed the scenario to help guide identifying an adequate amount of land for renewable development. However, any estimate will be incorrect and may become out-of-date quickly. Arizona's utilities are projecting a return to growth in energy demand to 3 or 4 percent per year which could drastically change in-state demand for renewable energy. Further, California's policy on out-of-state renewables will also change the amount of land adequate to meet demand. If the BLM is going to keep the RFDS it should explain how that number will impact departmental decision-making.

New Data

Summary:

The BLM should consider additional information for the RFDS and update it accordingly.

Response:

The RFDS was developed as a planning tool for the development and analysis of alternatives in the EIS and represents estimates based on data available at a point in time. The BLM recognizes that factors that influence renewable energy demand are likely to change over time, as new projects are developed, for example. Because the RFDS is not intended to be a dynamic document, it will not be updated in light of

newly available information, although this information could be used in the decision making process for site-specific projects.

Comments:

Submission No: RDEP-Drft-0006

Commenter: Alex Daue, The Wilderness Society

Comment: The assumption regarding in-state renewables demand, however, is too low. We note that the DEIS leaves out several factors that are likely to boost demand significantly beyond what is required under the 15% RES, including: The Salt River Project, a utility that serves approximately 40% of the state's electric load, is likely to purchase significant renewables. Although SRP is not currently obligated under the RES, its board of directors has committed to purchasing about 8% of its retail sales from renewable energy by 2020, per its Sustainable Portfolio Principles adopted in 2011. The US Army has set a goal of ensuring that 25 percent of the Army's electricity comes from renewable sources by 2025. Public entities such as cities, towns, counties, school districts, community colleges, and universities are large potential purchasers of renewable energy, which will increase in-state demand. For example, the city of Phoenix has a renewable energy goal for the city to use 15% renewable energy by 2025. ASU's goal is to install 20 MW of solar by 2014.

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: Estimated AZ Renewable Energy Output: The DEIS proposes that due to a combination of the state's 15% Renewable Energy Standard (RES) and demand from states such as California, which will want to purchase generation from Arizona's abundance of solar resources, it should be assumed that twice the amount of renewables generation needed to meet the in-state RES is generated in Arizona in the foreseeable future. We consider it a reasonable assumption that within the next 20 years, Arizona will generate about 16,000 GWh of renewable power that will be exported to California and other states. The assumption regarding in-state renewables demand, however, is too low. We note that the DEIS leaves out several factors that are likely to boost demand significantly beyond what is required under the 15% RES, including:

The Salt River Project, a utility that serves approximately 40% of the state's electric load, is likely to purchase significant renewables. Although SRP is not currently obligated under the RES, its board of directors has committed to purchasing about 8% of its retail sales from renewable energy by 2020, per its Sustainable Portfolio Principles adopted in 2011.

The US Army has set a goal of ensuring that 25% of the Army's electricity comes from renewable sources by 2025.4 4 See http://www.army.mil/article/75960/Army_to_invest__7_billion_in_renewable_energy_projects/

Public entities such as cities, towns, counties, school districts, community colleges, and universities are large potential purchasers of renewable energy, which will increase in-state demand. For example, the city of Phoenix has a renewable energy goal for the city to use 15% renewable energy by 2025. ASU's goal is to install 20 MW of solar by 2014.

Revising the RFDS

Summary:

The BLM should explain how the RFDS would be revised and updated for future use.

Response:

The RFD was developed as a planning tool for alternative development and analysis in the EIS and represents estimates based on data available at a point in time. The BLM recognizes that it is likely to become outdated as renewable portfolio standards, energy demand, and other factors change the level

of renewable energy required in the state. During plan reviews, the RFDS could be reviewed and updated as appropriate.

Comments:

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: The DEIS should delineate a process for adjusting the RFDS going forward. In addition to likely changes in demand for renewable energy, as renewable technologies develop and change and as we do more mapping of lands and resources, various aspects of the scenario are likely to need adjustment (i.e., the amount of land used by solar technology type, capacity factors, and assessments of which lands are high-resource-sensitivity). The DEIS should lay out a process for BLM to reconsider and adjust the RFDS and its elements at regular intervals.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Recommendation: The DEIS should delineate a process for adjusting the RFDS going forward. In addition to likely changes in demand for renewable energy, as renewable technologies develop and change and as we do more mapping of lands and resources, various aspects of the scenario are likely to need adjustment (i.e., the amount of land used by solar technology type, capacity factors, and assessments of which lands are high-resource-sensitivity). The DEIS should lay out a process for BLM to reconsider and adjust the RFDS and its elements at regular intervals.

Submission No: RDEP-Drft-0003
Commenter: Amanda Ormond, Interwest Energy Alliance
Comment: The BLM should also plan to review and update the RFDS on a bi-annual basis if it is using the information for decision-making.

G.2.23 Solar Energy Zone

Applying Additional Screens

Summary:

The SEZ should be screened for other sensitive resources, including wildlife habitat.

Response:

The Final EIS proposes a revised proposed Agua Caliente SEZ (Alternative 6) in response to public comments to minimize impacts on resources and additional information provided by AZDGF. The revised proposed Agua Caliente SEZ's boundary is 500 meters away on either side of the three washes (which were identified using AGFD's Species and Habitat Conservation Guide data, category 4). This takes into account the AGFD's comments on the SEZ. The revised proposed Agua Caliente SEZ does not include the northern portion of the SEZ, allowing for potential tortoise migration between the Palomas Mountains and Baragan Mountain.

The AGFD and the BLM view the AGFD predicted species raster datasets (AGFD 2012b) as unsuitable for a SEZ screen. Once an application is under consideration, site-specific biological surveys of the area's resources would be included in the NEPA analysis.

Comments:

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: The proposed Agua Caliente SEZ was a late addition to the RDEP public process. As this proposed SEZ is subject to pending policies

associated with the BLM and DOE's Solar Programmatic Environmental Impacts Statement, it was not subjected to the same screens as REDAs. All of the alternative configurations of the SEZ contain some significant environmental conflicts. However, we believe that specific areas, such as the southwest portion of the proposed SEZ directly adjacent to the western boundary of the NRG solar development, could be appropriate for designation as a SEZ (see ASWG comments, Section 4, "Proposed Agua Caliente SEZ")

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: Sonoran desert tortoise – According to the analysis we conducted using BLM and AGFD data, we found that the majority of lands within all of the SEZ alternatives are within the AGFD predicted distribution of the Sonoran desert tortoise (See map in Appendix B, and Table 3 below). Gila monster – According to the analysis we conducted using BLM and AGFD data, we found that the majority of all of the SEZ alternatives fall within predicted distribution of the Gila Monster. Western burrowing owl - According to the analysis we conducted using BLM and AGFD data, we found that very little AGFD predicted habitat for the Western burrowing owl coincided with any of the SEZ alternatives (see map in Appendix B, and Table 5 below)

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: Defenders' preliminary analyses of the overlay between proposed Agua Caliente SEZ alternatives and spatial data from the AGFD's Statewide Wildlife Action Plan and HabiMap have illuminated significant potential conflicts with special status species, as well as species of economic and recreational importance. Therefore, we do not believe any of the currently proposed DEIS alternatives are consistent with RDEP's intent and we therefore unable to support any of the proposed alternatives. BLM should include a modified preferred alternative in the Final DEIS that has adequately screened out these important wildlife habitats.

Arizona Game and Fish Department Suggested Modifications to SEZ

Summary:

The BLM needs to incorporate the suggested modifications to the SEZ from the AGFD.

Response:

BLM considered the new information presented by the AGFD, along with other commenters, and has revised the boundary for the Agua Caliente SEZ in Alternative 6 of the Final EIS (now termed the revised proposed Agua Caliente SEZ). The additional layers considered included a 1km buffer around the major washes, additional cultural resources survey data, and elimination of lands that were identified as having wilderness characteristics. These additional criteria have moved the SEZ boundary to be 500 meters away on either side of the three washes; these lands are identified in AGFD's Species and Habitat Conservation Guide data as category 4.

Comments:

Submission No: RDEP-Drft-0052

Commenter: Ginger Ritter, Arizona Game and Fish Department

Comment: The Department is also concerned with the inclusion of the Aqua Caliente Solar Energy Zone (SEZ). The Department was notified during the development of the DEIS of this inclusion and we submitted comments to modify the SEZ. It does not appear our comments were incorporated. We strongly recommend incorporating our modifications to the SEZ (see attached, Appendix 2).

County Planning

Summary:

The BLM should consider additional information from Yuma County planning documents and initiatives.

Response:

Section 202(c)(9) of FLPMA requires, to the extent practical, that the BLM keep itself informed of other federal agency and state and local land use plans, that it ensure that consideration is given to those plans that are germane to the development of BLM land use plan decisions, and that it assist in resolving inconsistencies between federal and non-federal plans.

RDEP's planning decisions under consideration in the EIS have been reviewed for consistency with Yuma County plans; the BLM determined that the goals, objectives, management actions, and allocations do not conflict with county land use plans. The BLM is monitoring Yuma county's ongoing planning effort to identify solar energy incentive districts including one that includes some of the proposed Agua Caliente SEZ.

Additionally, BLM policies and design features require offices to coordinate with prospective applicants and local governments and agencies. The BLM would require prospective applicants to schedule and participate in two preliminary meetings with the BLM before filing a ROW application in a REDA or variance area; the aim of the second preliminary meeting is to initiate and ensure early coordination with federal (e.g., NPS and USFWS), state, and local government agencies and tribes. The proposed programmatic design features include many opportunities for local government involvement and consultation, as follows

- Make early contact with local officials, regulators, and inspectors to explore all applicable regulations and address concerns unique to solar power generation projects.
- Emphasize early identification of, and communication and coordination with, stakeholders, including federal, state, and local agencies, special interest groups, Native American tribes and organizations, elected officials, and concerned citizens.
- Consult with local agencies about potential impacts of development in or close to state or local special use areas, such as parks.
- Avoid lands identified as incompatible by local governments for renewable energy development.
- Compare preliminary site grading, drainage, erosion, and sediment control plans with applicable local jurisdiction requirements.
- Consult federal, state, and local "waterwise" guidelines, as applicable, for project development in the arid Southwest.
- Site facilities to maximize local, regional, and statewide economic benefits and coordinate with local and state entities, such as state and county commissions and planning departments.
- Site projects to minimize adverse effects on area housing markets and local infrastructure (e.g., schools and other public services) and to ensure adequate housing vacancy rates and local infrastructure support for workers and their families (Solar Final PEIS, Volume 7, pg. 48).

Comments:

Submission No: RDEP-Drft-0008

Commenter: Paul Melcher, Department of Development Services

Comment: Moreover, the comments in the preceding paragraphs reflect county staff intent to provide for only PV/CPV development as the Board

of Supervisors considers the creation of a Renewable Energy Incentive District (REID) that would include BLM administered lands in the proposed SEZ. A copy of the initial staff report and district maps is attached hereto. The SEZ would be located in Area 3 as described in the report/maps. The creation of the five proposed REIDs was done with three specific goals in mind:

1) Locate utility-scale renewable energy PV/CPV projects on lands that are not valley agricultural lands (those lands in the Yuma, Gila, Mohawk and Texas Hill Valleys/Areas);

2) Locate utility-scale renewable energy PV/CPV projects near suitable transmission lines and roadway infrastructure; and

3) Limit negative environmental, social, and economic impacts to surrounding lands from utility-scale renewable PV/CPV energy projects.

As one might expect, staff has interviewed numerous project stakeholders in order to determine how the REID development project can achieve these goals. To that end, staff has recommended that REID boundaries include: lands vacant and/or undeveloped with little or no resource value; lands previously disturbed or underutilized for agricultural production; lands near 12kV and higher transmission lines; and lands near arterial roadways. In addition, staff will be recommending development standards that preserve wildlife corridors and habitats and provide mandatory buffering and screening to existing and future uses, among others. It is anticipated that this project will be completed in late September 2012."

Submission No: RDEP-Drft-0008
Commenter: Paul Melcher, Department of Development Services
Comment: Second, PV/CPV project structures would not exceed the height restriction of 60 feet for structures for the Rural Area zoning district, which is the predominant zoning district for both Arizona State Trust and privately held land in the SEZ. If developers on private or Trust prope11ies desire structures exceeding 60 feet in height, then a variance from the Yuma County Zoning Ordinance is required. In contrast, power towers can range from 60 meters (197 feet) to 700 meters (2,297 feet) in height. In neighboring La Paz County, for example, the Quartzite Solar Energy tower (located on BLM administered lands) is 653 feet (199 meters) in height. Since Yuma County has no zoning jurisdiction over properties owned by the federal government and, as a result, no means of restricting structure height to monitor visual impacts in the SEZ, the possibility exists that a solar project developed on federal land could contain one or more power towers over 600 feet in height. While PV/CPV projects less than 60 feet in height would likely not be visible from the Juan Bautista de Anza National Historic Trail corridor, a tower 650 feet in height could certainly be seen from there and as far away as 25 miles as shown in Figure 4-4 of the draft RDEP EIS. In fact, such a tower would be the dominating physical feature in the SEZ and in the Hyder Valley region of Yuma County. In order to avoid such a possible visual impact, staff recommends limiting CSP tower heights to 60 feet, matching the maximum height allowed for structures per the Yuma County Zoning Ordinance.

Submission No: RDEP-Drft-0008
Commenter: Paul Melcher, Department of Development Services
Comment: Given that Yuma County is establishing specific development standards for utility scale solar PV/CPV projects as described in the REID proposal, staff welcomes the opportunity to work with BLM to create a set of development standards that meet county standards. If BLM is so willing, staff would also be interested in discussing an agreement whereby Yuma County and BLM review and approve projects in accordance with Yuma County zoning and building code requirements. If this is not possible, staff would request the opportunity to comment on proposed projects as a collaborating partner.

Cultural Resources

Summary:

The BLM needs to consider additional cultural resources information in analyzing the SEZ.

Response:

Additional Class II surveys were conducted in the Agua Caliente SEZ. Results of the surveys found and documented previously unknown cultural resources. This new information has been included in the Final EIS in the affected environment, Section 3.4 Cultural Resources, with new analysis in the environmental consequences, Section 4.2.3. Any proposal for a solar or wind development will require due diligence, including NHPA, NEPA and cultural resource program policy compliance, such as potentially conducting a Class III inventory of the development proposal and a full analysis of the impacts on any resources in the area of potential effect.

Comments:

Submission No: RDEP-Drft-0030

Commenter: Matthew D Williamson CIV, US Army Garrison Yuma

Comment: A good portion of the proposed area is part of the Arizona-California training area for Patton during the late 1930's and early 1940's. They may want to have any area they are serious about using cleared for use by the Corp of Engineers. We do have maps of the training area but the Corp would still need to clear the area for use.

Submission No: RDEP-Drft-0016

Commenter: Robert Mark, Rupestrian Cyber Services, Flagstaff Meeting Transcripts

Comment: Sears Point is quite close to the proposed solar site, and I just want to express some concerns. First of all, the visual impacts of the development. And, secondly, the Sears point study area is dense with not only petroglyph panels, but other cultural features, including rock alignments, geoglyphs, and prehistoric and historic trails. And I hope these will all be properly considered in making any decision as to what disturbances are appropriate in the proposed site.

Submission No: RDEP-Drft-0004

Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe

Comment: While the [Quechan Indian] Tribe generally supports environmentally responsible solar and wind energy project planning, the Agua Caliente Solar Energy Zone (SEZ) falls on sensitive land that contains important cultural resources and the proposed threatened flat-tailed horned lizard habitat. The Tribe cannot support the preferred alternative in light of the Agua Caliente SEZ.

Submission No: RDEP-Drft-0004

Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe

Comment: A. The Tribe Supports Responsible Renewable Energy Planning That Does Not Include the Agua Caliente SEZ.

The Agua Caliente SEZ is located on sensitive lands that may contain hundreds of important cultural resources and includes the flat-tailed homed lizard habitat. No cultural resources have been documented within the SEZ because no archeological surveys have been conducted on the land. DEIS, Cultural Resources, 3-20. The DEIS itself admits that Class III surveys would be necessary for any potential projects within the SEZ area (Cultural Resources, 3-22). However, surveys of the area should occur prior to any decision on designation of the area as an SEZ. The DEIS acknowledges that archaeological sites, historic structures, and traditional cultural properties could be completely destroyed by the clearing, grading, and excavation for projects. Environmental Consequences (Cultural Resources), 4-20. Construction of facilities and related infrastructure could also destroy such cultural resources. Id. Beyond direct impacts, altered topography and hydrologic patterns, soil removal, and soil erosion could harm or destroy significant cultural resources within a project area. Id.

""Cultural resources are nonrenewable and, once damaged or destroyed, are not recoverable."" Id. at 4-21.

Though the SEZ area has yet to be surveyed, 14 previously recorded sites exist within one mile of the SEZ. DEIS, Cultural Resources, 3-20. These previously recorded sites contain hearths, geoglyphs, trails, and rock rings. Id. The SEZ area likely contains similar artifacts, and may contain even more, as archeological field maps show three prehistoric trails within the area. See Id. The SEZ is located within the Tribe's traditional territory, and it likely contains many valuable cultural resources from Quechan ancestors. The Tribe would be devastated to lose such important pieces of its history.

Access

Summary:

The BLM needs to consider access to its lands if development is proposed within the SEZ.

Response:

In response to comments and concerns regarding access along the Palomas-Harquahala Road through the SEZ, a new management action has been added to Alternative 6 (Preferred Alternative) to state that access along the road must be maintained or rerouted if it were disrupted by any SEZ development.

Comments:

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: Parcel of approximately 2,000 acres west of the southern portion of the White Wing Ranch solar development (Figure 1): This parcel has seen severe impacts from users, making it suitable for large-scale development with few impacts on issues of environmental importance. The BLM should address public access to BLM lands north of this parcel if development is proposed here.

Submission No: RDEP-Drft-0057

Commenter: Robert Zittle

Comment: This will also restrict and/or deny access to the public lands behind the proposed project and nothing has been said about establishing a new alternate route to these lands. Federal law prohibits any act that denies access to public lands for the general populations. The BLM cannot deny access to these lands.

Modifying the SEZ Boundaries

Summary:

The BLM should consider modifying the SEZ boundaries to avoid sensitive resources and uses.

Response:

BLM considered the new information presented by the AGFD, along with other commenters, and has revised the boundary for the Agua Caliente SEZ (now termed the revised proposed Agua Caliente SEZ). The additional layers considered included a 1km buffer around the major washes that resulted in moving the SEZ boundary to 500 meters away on either side of the three washes (identified by AGFD's Species and Habitat Conservation Guide data as category 4), thereby preserving wildlife corridors in the washes. The revised proposed Agua Caliente SEZ also removes the northern portion of the largest SEZ footprint to maintain the area for potential tortoise migration between the Palomas Mountains and Baragan Mountain. The revised proposed SEZ also avoids most lands with wilderness characteristics not managed to protect those characteristics. An additional management action would provide access along or rerouting to accommodate access on the Palomas-Harquahala Rd. to ensure that is it not disrupted

by any SEZ development. This revised proposed Agua Caliente SEZ results in consolidating the area into an even smaller footprint.

In consultation with the AGFD, both agencies agree that the AGFD's predicted species raster datasets (AGFD 2012b) as unsuitable as a SEZ screen. Once an application is under consideration, site-specific biological surveys of the area's resources would be conducted and the findings included in the NEPA analysis.

Comments:

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: Parcel of approximately 8,000 acres on the east side of the proposed SEZ (Figure 2): This site has potential for large-scale development as it avoids two of the three major issues that exist on other areas of the proposed Agua Caliente SEZ including Citizen Proposed Wilderness (CPW) lands and major conflicts with the hunting community. While there are ecologically sensitive areas including xeroriparian zones within this parcel, it is of sufficient size and scale to both accommodate renewable energy development and likely mitigation factors including the following:

o Washes: The Desert washes including the large Baragan Wash should be preserved within a sizable corridor that can accommodate wildlife passage and protect existing ecological resources.

o Access: Legally created roads and trails within and around this parcel that are not damaging to natural and cultural resources should be accommodated either in their current locations or in appropriate places to ensure continued access to these and proximate lands.

o Wildlife: Wildlife connectivity in both the east-west and north-south directions should be preserved under any development scenario to limit the negative effects of fragmentation of the Palomas Plain Wildlife Habitat Area.

Submission No: RDEP-Drft-0006

Commenter: Alex Daue, The Wilderness Society

Comment: We offer the following alternative SEZ configurations involving two parcels:

Parcel of approximately 2,000 acres west of the southern portion of the White Wing Ranch solar development (Figure 1): This parcel has seen severe impacts from users, making it suitable for large-scale development with few impacts on issues of environmental importance. The BLM should address public access to BLM lands north of this parcel if development is proposed here.

Parcel of approximately 8,000 acres on the east side of the proposed SEZ (Figure 2): This site has potential for large-scale development as it avoids two of the three major issues that exist on other areas of the proposed Agua Caliente SEZ including Citizen Proposed Wilderness (CPW) lands and major conflicts with the hunting community. While there are ecologically sensitive areas including xeroriparian zones within this parcel, it is of sufficient size and scale to both accommodate renewable energy development and likely mitigation factors including the following:

o Washes: The Desert washes including the large Baragan Wash should be preserved within a 1 km corridor that can accommodate wildlife passage and protect existing ecological resources.

o Access: Legally created roads and trails within and around this parcel should be accommodated either in their current locations or in appropriate places to ensure continued access to these and proximate lands.

o Wildlife: Wildlife connectivity in both the east-west and north-south directions should be preserved under any development scenario to limit the negative effects of fragmentation of the Palomas Plain Wildlife Habitat Area.

Submission No: RDEP-Drft-0008

Commenter: Paul Melcher, Department of Development Services

Comment: As stated above, staff supports Alternative 3 with amendments to the site area as shown in Figure I below. These amendments provide a means to preserve wildlife corridors in wash areas and to preserve existing access to public lands. Specifically, Figure I represents a realignment of Alternative 3 boundaries through removal and addition of BLM administered lands within the Agua Caliente SEZ area. Recognizing that the intent of the SEZ is to utilize parcels of BLM land 2,500 acres or greater in size, staff proposes removing AREAS I and 2 while concurrently adding AREAS 3 and 4 to the Alternative 3 area boundary, resulting in a net increase in its size. Additionally, staff proposes adding AREA 5 to show the connection to transmission facilities with the understanding that actual generation projects would not be developed in it. If adding AREA 5 would create confusion as to the areas where actual projects could be developed, then staff proposes BLM represent on a map where it anticipates Alternative 3 solar projects will connect to transmission facilities.

In order to mitigate potential detrimental impacts to wildlife corridors and access to public lands, staff recommends eliminating AREAS I and 2 to prevent solar development in Hoodoo and Baragan Washes and on Palomas/Harquahala Road. Staff supports adding Area 4 to maintain a minimum project site size of 2,500 acres since its shape excludes Baragan Wash on its southern boundary, excludes Clanton Wash on its northeast boundary, and proposes no immediate impact on public land vehicular access. As a result, planning staff believes that the amendments as proposed in the preceding two paragraphs maintain the viability of solar development within Alternative 3 boundaries while preserving natural resources and public access to them.

Submission No: RDEP-Drft-0005

Commenter: Katherine Gensler, Solar Energy Industries Association

Comment: We support BLM's desire to establish a new Solar Energy Zone near Agua Caliente. As the Draft EIS indicates, the proximity of this site to existing infrastructure makes it a generally attractive location. However, we urge BLM not to adopt the boundaries established by Alternative 6, the Preferred Alternative. When considering a new SEZ, one of the most important features is to ensure that there are enough acres in a single parcel to support development of multiple utility-scale solar energy power plants. On the surface, 6,770 acres appears to be capable of supporting approximately 600 MW of solar development. However, those acres are spread across three distinct parcels of land, a configuration which does not ensure that the SEZ will be commercially attractive to developers. Instead, we encourage BLM to go back to the original boundaries in Alternative I and reassess the suitability of the entire area for designation as a SEZ.

Submission No: RDEP-Drft-0045

Commenter: Douglas Beach

Comment: To put more solar around near Whitewing Ranch Dateland, AZ on BLM land would damaging prime wildlife habit for many species of animals. More land striped of vegetation and fenced like Whitewing ranch is devastating to wildlife. Use the land south of Interstate 8 and north of the railroad tracks between Dateland and Gila Bend or from Tacna to Mohawk Pass for solar projects.

Recreation

<u>Summary:</u>

The BLM needs to consider additional baseline information and impact analysis for recreational uses in the SEZ.

<u>Response:</u>

The revised proposed Agua Caliente SEZ responds to public comments to minimize impacts on resources. The revised proposed Agua Caliente SEZ's boundary is 500 meters away on either side of the three washes, which were identified using AGFD's Species and Habitat Conservation Guide data, category 4. Avoiding the washes would preserve wildlife corridors, helping to preserve hunting

resources. The revised proposed Agua Caliente SEZ does not include the northern portion of the SEZ, allowing for potential tortoise migration between the Palomas Mountains and Baragan Mountain. Access disrupted by any SEZ development must be maintained or rerouted.

Comments:

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: Conflict with the Hunting Community: The greatest issue raised with regard to the Agua Caliente SEZ proposal by members of the public is the popularity and reliance on this area by hunters originating from the Yuma area. As documented by Arizona Game and Fish Department, there are a number of game species that have been documented in the proposed SEZ including dove, quail, mule deer, and mountain lion.

REDA Criteria

Summary:

The SEZ should be screened using the same criteria used to identify the REDAs.

Response:

In addition to identifying REDAs, the RDEP is serving as a step-down process to the Solar PEIS. The proposed Agua Caliente SEZ was identified based on a similar but different screening process from the REDAs in order to address specific needs of utility scale solar development. This process focused on the following criteria: available large contiguous parcels of BLM land (greater than 2,500 acres); proximity to transmission; limited known environmental or cultural constraints; proximity to roads and infrastructure; and preferably near existing development in order to consolidate impacts and minimize fragmentation. About 20,600 acres in the Agua Caliente area proved to best meet the overall criteria.
After identification of the proposed Agua Caliente SEZ, the BLM solicited the regional Arizona Game and Fish office, tribes (through ongoing consultation), and stakeholder groups for resource information specific to that location. These groups provided information indicating that portions of the SEZ provided recreational opportunities, hunting, access to other lands, cultural resources, and wildlife habitat and movement corridors. As a result of this input, a smaller SEZ footprint was also proposed for consideration in the Draft EIS.

Based on public comments on the Draft EIS, along with additional information from AGFD, the BLM has developed a revised SEZ boundary to address wildlife habitat and migration, lands with wilderness characteristics, cultural resources, and riparian areas. The revised boundary includes a 1 km buffer around the major washes to preserve wildlife corridors; removes the northern portion of the largest SEZ footprint to maintain the area for potential tortoise migration between the Palomas Mountains and Baragan Mountain; and avoids most "lands with wilderness characteristics not managed to protect those characteristics."

Comments:

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: Different environmental assessments conducted for RDEP REDA lands and the Agua Caliente SEZ. The RDEP process is an effort to identify disturbed or low-conflict lands or renewable energy development. Generally, REDA lands that have undergone RDEP screening process and identified in the DEIS fit this description. The proposed Agua Caliente SEZ did not go through this process and, as a result, does not—in its entirety—

fit this description. While SEZs are not required to go through the RDEP screening process, application of these screens to proposed SEZs could further reduce the potential for conflicts should these SEZs be approved. We note three areas of conflict identified through our study:

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Disturbed lands: while the presence of disturbed lands is certainly an important and appropriate factor to consider in identifying new SEZs, there may be undisturbed areas with low environmental values that could be suitable for SEZ designation; these areas should also be considered for SEZ designation if they meet the other criteria.

Submission No: RDEP-Drft-0007
Commenter: Greta Anderson, Western Watersheds Project
Comment: The RMP states that the Palomas Plain Wildlife Habitat Area (WHA) is a potential reintroduction area for Sonoran pronghorn because it is large and relatively unfragmented. RMP at 2.53. The Agua Caliente SEZ overlaps the WHA and would indeed fragment and diminish the potential for reintroduction of this imperiled species. Moreover, the current ROD provides management direction to "concentrate developments such as utility facilities in areas already developed or disturbed in the Palomas Plain WHA." ROD-ARMP WF-052. It is not clear that the Agua Caliente SEZ would be located in an area already developed or disturbed; indeed, it overlaps substantially with a citizen proposed wilderness area. Furthermore, the RDEP identifies REDAs as withdrawing from consideration lands within special management designations, making the inclusion of the Agua Caliente SEZ that much more of a disjunction with the rest of the proposal.

Solar Energy Zone Selection Criteria

<u>Summary:</u>

The BLM should eliminate the Proximity to Existing Development criterion for selection of a SEZ and should use Previous Disturbance as the only criterion for selecting a SEZ.

<u>Response:</u>

The RDEP is to serve as a "step-down" to the Solar PEIS by considering whether to identify a SEZ for utility-scale solar. This requires a large contiguous parcel of BLM land (greater than 2,500 acres). None of the nominated disturbed sites meet these criteria. Proximity to development was just one of other criteria that the Arizona BLM used to help identify the Agua Caliente SEZ. As commenters noted, using proximity to existing development is likely to make an area a more desirable locality for future development, but more importantly it is viewed as a means to consolidate development in order to minimize impacts, such as habitat fragmentation.

<u>Comments:</u>

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Proximity to existing solar development: while proximity to existing development is a good indicator of development interest, this should not be a requirement for new SEZs

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: While most of the SEZ identification criteria listed in the DEIS are appropriate (DEIS, p. 2-19), as the BLM reviews REDAs for potential additional SEZ designations, we recommend the following changes to the criteria:
Proximity to existing solar development: while proximity to existing development is a good indicator of development interest, this should not be

a requirement for new SEZs; and Disturbed lands: while the presence of disturbed lands is certainly an important and appropriate factor to consider in identifying new SEZs, there may be undisturbed areas with low environmental values that could be suitable for SEZ designation; these areas should also be considered for SEZ designation if they meet the other criteria.

Submission No: RDEP-Drft-0004
Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe
Comment: The Tribe supports Alternative 5 because it concentrates renewable energy development on BLM-administered lands that prior planning processes have determined are appropriate for disposal. DEIS, Alternative 5: Land Tenure REDA, 2-33. Alternative 5 eliminates the Agua Caliente SEZ since the Yuma Resource Management Plan did not designate any lands within the SEZ footprint as suitable for disposal. Id. at 2-36. Utilizing previously identified disturbed land reduces the risk of loss to cultural resources, and still allows for needed renewable energy development. In the Final EIS, BLM should include an alternative that provides for solar and/or wind energy development on significantly and permanently disturbed lands, but that does not include the Agua Caliente SEZ.

Water – Affected Environment and Impact Analysis

Summary:
The BLM should consider additional water information in the analysis for the SEZ.

Response:
The BLM has reviewed the SEZ affected environment section on water resources and determined that the commenters were correct in noting that additional information should be included. The SEZ Water Resources affected environment description in Chapter 3, Section 3.23.2 has been revised in the Final EIS to include recognition of the limited hydrologic information available for the area and the results of historic agricultural use of the area on existing surface and groundwater resources. Additionally, the impact analysis discussion in Chapter 4, Section 4.2.23 has been revised to consider the effects of renewable energy development on ephemeral streams and the natural drainage patterns within the SEZ.

Based on public comments, the BLM has prepared a revised proposed Agua Caliente SEZ boundary which is 500 meters away on either side of the three washes. The Revised SEZ is identified as being in Water Protection Zone 2, which would have the additional design feature requiring industrial water use to be limited to dry cooling technologies.

The BLM will cooperate with state governments, including the Arizona Department of Environmental Quality, to protect and enhance public health and the environment by reducing the impact of pollutants discharged to surface and groundwater in accordance with the Safe Drinking Water Act, the Clean Water Act, and all applicable Aquifer Protection Permits

Comments:
Submission No: RDEP-Drft-0062
Commenter: Kathleen M. Goforth, Environmental Protection Agency, Environmental Review Office
Comment: We recommend that the BLM take particular care when siting projects within the proposed Agua Caliente Solar Energy Zone (SEZ). We acknowledge the time and effort expended to identify the SEZ, and commend the BLM for proposing a SEZ to complement those proposed in the Solar Programmatic Environmental Impact Statement. The topography of the SEZ, however, may present challenges for siting solar energy projects. The DEIS describes the proposed SEZ land surface as "scoured by a braided series of washes

and ephemeral streams," and including "at least six wide ephemeral washes on site and a network of minor braided streams that discharge into the ephemeral washes" (p. 3-173). The DEIS goes on to state that although National Wetland Inventory maps do not "identify mapped wetlands within the proposed SEZ analysis area," the area "likely has jurisdictional ephemeral waters of the U.S." Although cognizant of the BLM's commitment to avoid "surface waters, wetlands, streams, and floodplains" (a commitment demonstrated by reducing the size of the proposed SEZ, in part, to avoid braided channel floodplains), and supportive of the strong design features and best management practices in the DEIS to protect water resources, we feel there is potential for solar energy projects to affect ephemeral streams, and thereby the natural drainage patterns, within the proposed SEZ. We recommend that the BLM work with the Army Corps of Engineers to identify and avoid all jurisdictional ephemeral waters.

Submission No: RDEP-Drft-0001
Commenter: Michael J. Lacey, Arizona Division of Water Resources
Comment: Limited hydrogeologic information is available in the vicinity of the proposed Agua Caliente Solar Energy Zone (SEZ). Historic and current agricultural land uses have caused water level declines in the region. Similar aquifer responses would be anticipated from utility-scale CSP facilities. ADWR has made no analysis or regulatory determinations as to the sustainability of the groundwater system in this region at this time. Additionally, water quality in this region is generally poor. ADWR understands that CSPs require boiler-quality water for cooling and other uses. Inclusion of a discussion on the potential consequences of treatment by-product disposal may be warranted.

Wildlife Habitat Area

Summary:
The BLM needs to include analysis for impacts on the Palomas Plain WHA.

Response:
The revised proposed Agua Caliente SEZ has a smaller footprint and therefore fewer potential impacts on the Palomas Plain Wildlife Habitat Area. The impacts on the Palomas Plain Wildlife Habitat Area are discussed in the environmental consequences (Fish and Wildlife) section, DEIS pg. 4-44.

Comments:
Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Overlap with the Palomas Plain Wildlife Habitat Area (WHA): The Palomas Plain WHA is a critical area for the conservation of a variety of species and is considered to be the largest unfragmented section of Sonoran Desert habitat. Some species that rely on this area are endangered, threatened, or candidate species including the Sonoran Desert tortoise, the Sonoran Desert population of the bald eagle, cactus ferruginous pygmy-owl, and Sonoran Desert pronghorn, once released from their reintroduction site in the Kofa National Wildlife Refuge. Although the proposed SEZ overlaps only a small portion of this WHA, and there are no known instances of endangered, threatened, or candidate species in the area, impacts on this WHA should be a factor in the adoption and development of the SEZ.

Wilderness Characteristics

Summary:
The BLM needs to consider additional impact analysis for the lands with wilderness characteristics in the SEZ.

Response:

The three Agua Caliente SEZ footprints analyzed in the draft EIS are in compliance with the Yuma Field Office RMP wilderness direction and avoid all lands being actively managed for wilderness characteristics. Based on public comments, the BLM has developed a revised proposed Agua Caliente SEZ footprint (Alternative 6) which also avoids most lands with wilderness characteristics but are not being managed to protect those characteristics. These acres are adjacent to a recent new solar development, which has altered the overall characteristics in the region. Additionally, the analysis for lands with wilderness characteristics in the SEZ was reviewed and updated to reflect the revised SEZ footprint. See Section 4.2.25, Wilderness Characteristics in the Final EIS.

Comments:

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comments: Lands with Wilderness Characteristics (LWC) and Citizen Proposed Wilderness (CPW) Areas: When the Yuma Resource Management Plan (RMP) was being revised in 2005, Arizona Wilderness Coalition and other environmental groups provided the BLM with an inventory identifying lands with wilderness character, requesting that the agency manage the lands to protect those characteristics. The final RMP identified LWCs in the Palomas Mountains and Baragan Wash units. The BLM chose to manage a portion of the Palomas Mountains unit to maintain its wilderness characteristics, but the agency did not protect the remainder of the Palomas Mountains unit or any of the Baragan Wash unit. These BLM-recognized LWCs are also CPW units. While none of the Palomas Mountains LWC being managed to protect them overlap with the proposed SEZ, significant portions of both the Palomas Mountains and Baragan Wash LWCs not being managed to protect them are within some of the BLM proposed alternative configurations for the proposed SEZ. This could result in significant conflicts should solar development be proposed in these areas.

Wildlife

Summary:

The BLM needs to consider additional impact analysis and affected environment information for wildlife found in and around the SEZ.

Response:

As noted above, the BLM has revised the Agua Caliente SEZ footprint to further reduce the likelihood for impacts to known sensitive resources in the area. The new footprint excludes the northern portion of the maximum Agua Caliente SEZ area, resulting in protection of tortoise and their migration route between the Palomas Mountains and Baragan Mountain. Additionally, the Revised SEZ footprint removed the major east and west washes to allow for wildlife migration along these riparian corridors. The analysis in Chapter 4, Environmental Consequences has been revised to reflect these changes and any additional information on the wildlife found in the area.

Comments:

Submission No: RDEP-Drft-0007

Commenter: Greta Anderson, Western Watersheds Project

Comment: The DEIS dismisses potential impacts to Sonoran desert tortoise in the SEZ because "no special status species have been recorded within the proposed SEZ." DEIS at 4-121. But some of the

acreage within the proposed footprints for the Agua Caliente SEZ does contain desert tortoise habitat and the SEZ area provides linkage habitat between the Palomas Mountains and Baragan Mountains tortoise habitats and populations. As such, impacts to desert tortoise, desert tortoise habitat, loss of connectivity and increased fragmentation must be considered here and the DEIS's failure to do so renders it insufficient under NEPA.

Submission No: RDEP-Drft-0053
Commenter: Steven L. Spangle, US Fish and Wildlife Service
Comment: Page 3-145, Table 3-33- Desert tortoise- If there is classified tortoise (Gopherus morafkai) habitat on Barragan Mountain to the north of the proposed Agua Caliente SEZ and on the Palomas Mountains to the west of that area, tortoise may traverse the SEZ area during movement between those or other areas. Mobile wildlife species do not usually persist through time on isolated patches of habitat. Connectivity between patches can be important to long term survival and conservation.
Page 3-146, 3rd paragraph- Again, if there is classified tortoise habitat on Barragan Mountain to the north of the proposed Agua Caliente SEZ and on the Palomas Mountains to the west of that area, tortoise may traverse the SEZ area during movement between those or other areas. Mobile wildlife species do not usually persist through time on isolated patches of habitat. Connectivity between patches can be important to long term survival and conservation.

Submission No: RDEP-Drft-0004
Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe
Comment: While the [Quechan Indian] Tribe generally supports environmentally responsible solar and wind energy project planning, the Agua Caliente Solar Energy Zone (SEZ) falls on sensitive land that contains important cultural resources and the proposed threatened flat-tailed horned lizard habitat. The Tribe cannot support the preferred alternative in light of the Agua Caliente SEZ.

Submission No: RDEP-Drft-0053
Commenter: Steven L. Spangle, US Fish and Wildlife Service
Comment: Page 4-124, 4th paragraph- Again, if there is classified tortoise habitat on Barragan Mountain to the north of the proposed Agua Caliente SEZ and on the Palomas Mountains to the west of that area, tortoise may traverse the SEZ area during movement between those or other areas. Mobile wildlife species do not usually persist through time on isolated patches of habitat. Connectivity between patches can be important to long term survival and conservation.

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: The proposed Agua Caliente SEZ is in close proximity to the captive breeding pen on the Kofa NWR. While the reintroduced pronghorn are currently constrained to the captive breeding pens, future releases from this and adjacent sites are anticipated once the captive population reaches a sufficient size threshold. At that time, Sonoran pronghorn will be free to move across the landscape, at which point they may encounter and be impacted by solar development projects and associated infrastructure and disturbance

Wildlife—Mitigation Measures

Summary:

The BLM needs to consider extensive avoidance and additional mitigation measures in the SEZ to avoid impacts on wildlife riparian habitat.

Response:

Based on comments, the BLM has revised the Agua Caliente SEZ footprint to remove the east and west washes, lands with wilderness characteristics, and areas with known cultural resources. This reduced

footprint removes the northern portion of the maximum Agua Caliente SEZ area, resulting in protection of tortoise and their migration route between the Palomas Mountains and Baragan Mountain. Additionally, by removing the major east and west washes, wildlife would be able to use the riparian corridors for movement through the area. Also, the SEZ does not include the northern portion of the maximum footprint allowing for potential tortoise migration between the Palomas Mountains and Baragan Mountain.

Any impacts that could result from a development proposal on the SEZ would be mitigated through siting decisions and the application of the required design features. For those impacts that are not fully avoided or minimized, the BLM would determine whether measures to offset or mitigate negative impacts would be appropriate and could recommend such measures following consultation with affected stakeholders.

The BLM proposes to establish regional mitigation plans for development in SEZs, including the revised proposed Agua Caliente SEZ. The framework outlined in the Final Solar PEIS incorporates many of the components suggested in the comments received, including allowing mitigation on both public and private lands, considering the full range of mitigation tools available (including changing land designations and restoration), ensuring adequate funding over time, acquiring third-party-managed mitigation funds, monitoring, and using adaptive management strategies to certify that mitigation is adequate relative to impacts over time. Such plans would establish priority mitigation activities and locations based on, and consistent with, existing conservation objectives, resource management plans, and other federal, state and local goals. See Section A.2.5 of the Final Solar PEIS for additional details.

Comments:

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: If the easternmost parcels in the proposed SEZ (Portions of Alternatives 1, 2, 4, 6) are to be included in an SEZ configuration, extensive grading may be necessary to facilitate development, as the terrain in this area undulates significantly and may be prone to sheet flow during major precipitation events. Thus, Defender's support for inclusion of this area as part of an SEZ will be contingent upon the BLM incorporating generous avoidance and mitigation for riparian corridors, as well as exclusion of special status species and game species habitats consistent with our recommendations above.

G.2.24 Socioeconomics - Impact Analysis

Summary:

A commenter questions whether there is an estimated percentage savings of time that the RDEP EIS will save the applicant over BLM doing nothing.

Response:

As stated in Section 1.5.3, Requirements for Further Environmental Analysis, site-specific environmental reviews for renewable energy development projects that begin after the ROD for this EIS is finalized would be tiered to this EIS; using the analysis provided in the EIS and design features developed in this plan, this information would reduce time and therefore costs to developers. While the development of REDAs aims to guide developers to areas that contain fewer barriers to development, these areas are not guaranteed to be free of issues. As stated in the DEIS "This EIS will not eliminate the need for site-specific environmental review for future individual renewable energy development proposals; the BLM

will make individual decisions on a case-by-case basis whether or not to authorize individual renewable energy development projects in conformance with the amended land use plan on the basis of this EIS" (DEIS pp 1-13). Having the EIS and amendments done, will save time and money for applicants.

Comments:

Submission No: RDEP-Drft-0058

Commenter: Buster Johnson, Mohave County Board of Supervisors

Comment: From the standpoint of an applicant, proposing a renewable energy project, is there an estimated percentage savings of time that this EIS will save the applicant, in obtaining a decision from the BLM, over a "no action" alternative?

G.2.25 Transmission – Impact Analysis

Summary:

The BLM needs to address transmission line capacity and direct and indirect transmission effects, including impacts from new power lines.

Response:

The purpose of RDEP is to identify lands with solar and wind potential and low resource sensitivity. As noted in the Draft EIS, the RDEP EIS is a programmatic approach to planning allocations across Arizona BLM-administered lands; the descriptions of the affected environment and the analysis in environmental consequences is of sufficient detail to support the programmatic nature of the EIS. Impacts associated with renewable energy including transmission lines were generally described in Chapter 4. Transmission line planning for energy development is generally based on business and financial decisions of the applicants; these decisions rely on multiple variable outside the control of the BLM, including site conditions, technology, project output, power purchase agreements and terms, line capacity, market demand, and financing, and would be speculative within the scope of RDEP.

As part of the planning process, Alternatives 2 and 6 (Preferred Alternative) identified REDAs that were close enough to existing transmission facilities as to make it more efficient and cost effective to bring the energy online and to deliver it to market while minimizing environmental impacts. Although the DEIS identified REDAs, renewable energy developments can be proposed outside of a REDA, including those locations that could be more economically viable, on a case-by-case basis using applicable national policy direction and guidance from existing land use plan decisions. However, proposed renewable energy development on sites not identified as REDAs would be subject to current land use plan requirements and guidance. Processing applications in these non-REDA locations would take more time to evaluate the site location, to conduct environmental and cultural reviews, to develop appropriate mitigation measures, to effectively collaborate with stakeholders, and, in some cases, to prepare a land use plan amendment (EIS, Section 1-3).

It is also important to recognize that the REDAs are identified for potential development. Any proposal for an actual project would require due diligence, including NEPA compliance. At the site specific level, the proposed project requirements, which could include new transmission lines and facilities, would be reviewed against the resources of the specific location to determine if there are additional issues that could not be recognized at the larger landscape scale. Once an application is under consideration, site-specific descriptions of the area's resources would be included in the NEPA analysis, and particular elements of a project's design would provide the context for specific impacts.

Comments:

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Cost Reduction and Efficiency Gains: While the intended goal of reducing costs and enhancing efficiency is worthy, what the BLM proposes carries an unintended consequence that would actually increase costs for many prospective solar projects, both at smaller commercial scales and larger utility scales, by forcing them onto delivery systems at greater distances and higher voltages than necessary. Moreover, gen-tie length is only one of two very important factors affecting overall transmission development needs and costs. The interconnection of new generation to any existing power line typically requires physical upgrades to surrounding power infrastructure. Such "system upgrades" may consist of replacing and/or adding conductors (wires) to existing lines. In other cases, completely new lines must be built to accommodate the injection of additional power into existing networks.

Submission No: RDEP-Drft-0069
Commenter: Dr. John Nishio
Comment: Please also consider the cost of transmitting the produced energy via long transmission lines. There is a loss of energy during such transmission and the resources that go into such transmission lines are significant.

Submission No: RDEP-Drft-0057
Commenter: Robert Zittle
Comment: Third most of the power generated from this proposed project will not benefit the local population as it will be routed to areas outside the community.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: System reinforcements that may be required by the introduction of new gen-ties may cause either requirements for upgrades to existing power lines or construction of new power lines;

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: New power lines, including gen-ties, through otherwise undeveloped areas cause much greater direct, indirect, and cumulative environmental impacts in currently un-fragmented areas than upgrades of existing power lines, because they include new roads, transmission poles or towers, right-of-way maintenance, and other activities and infrastructure that are associated with transmission lines;

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: The primary goal in considering limitation of the lengths of both new power lines and upgrades to existing power lines is the minimization of disruption to ecosystems and existing habitat areas. Specifically, introduction of new and upgraded power lines can potentially cause habitat fragmentation, thereby reducing wildlife connectivity between areas within particular wildlife species' domains;

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: Construction, operation, and maintenance of higher voltage power lines causes greater impacts than lower voltage power lines because the roads, transmission poles or towers and construction and maintenance activities required for higher voltage power lines are larger and more intensive.

G.2.26 Tribal Interests

Consultation

Summary:

The BLM needs to complete tribal consultation before the RDEP is finalized. The BLM also needs to involve tribal people, not just tribal governments, as directed by the MOU on Environmental Justice and EO 12898.

Response:

BLM initiated consultation with governments of 23 affected Indian tribes early in the RDEP development process; shared information and provided opportunities for review and comment on the development of EIS alternatives throughout the NEPA process; and participated in 16 meetings with 13 tribes, many of which involved BLM line managers and elected tribal leaders. The State Director also made presentations to tribal leaders at two meetings of the Inter Tribal Council of Arizona and discussed the RDEP at a meeting attended by representatives of seven tribes on May 23, 2012. The BLM welcomes additional discussions with tribes on planning for renewable energy development while avoiding or mitigating impacts on natural, cultural, and heritage resources. While the RDEP identifies lands that may be suitable for renewable energy development, any specific proposals for energy projects will be assessed on a case-by-case basis with early and frequent consultation with interested tribes. BLM would consult with tribes on REDA-specific issues or resources of concern, including those related to environmental justice. We would also encourage consultations to define priorities for studies that could synthesize or acquire information relating to the history of tribal land use and associated cultural and heritage values within certain areas that could be subject to energy development. Such efforts could support the development of regional mitigation strategies or identify previously unknown resource conflicts that would be incompatible with energy development.

The Section 106 consultation process and the NEPA public participation process are open to all tribal organizations and individuals, and BLM encourages their participation. In addition, in consulting with tribal governments, BLM requests their assistance in identifying elders, traditional religious practitioners, and other individuals who may offer relevant information or concerns.

Comments:

Submission No: RDEP-Drft-0004

Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe

Comment: The NHPA requires ongoing consultation with interested Indian tribes throughout the identification and evaluation of cultural resources and the resolution of adverse effects. 36 C.F.R. § 800.3(f)(2); 800.4(a)(4); 800.5(c)(2)(iii); 800.6(a); 800.6(b)(2), etc. Additionally, multiple Executive Orders require ongoing consultation with Indian tribes where federally approved actions affect tribal interests. See Executive Order 12875, Tribal Governance (Oct. 26, 1993) (the federal government must consult with Indian tribal governments on matters that significantly or uniquely affect tribal governments); Executive Order 12898, Environmental Justice (Feb. 11, 1994) (federal government must consult with tribal leaders on steps to ensure environmental justice requirements); Executive Order No. 13007, Sacred Sites (May 24, 1996) (federal government is obligated to accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, avoid adversely impacting the physical integrity of sites, and facilitate the identification of sacred sites by tribes); Executive Order No. 13084, Consultation and Coordination with Indian Tribal Governments (May 14, 1998) (places burden on federal government to

obtain timely and meaningful input from tribes on matters that significantly or uniquely affect tribal communities); Executive Order 13175, Consultation with Indian Tribal Governments (Nov. 6,2000) (the federal government shall seek to establish regular and meaningful consultation with tribes in the development of federal policies affecting tribes).
BLM must complete consultation with the [Quechan Indian] Tribe in order for the RDEP to comply with federal law.

Submission No: RDEP-Drft-0041
Commenter: Mark T. Altaha, White Mountain Apache Tribe Historic Preservation Office
Comment: Please be advised such proposed RDEP projects may have the potential to have a negative impact to cultural heritage resources considered sensitive to Native American tribes. As part of the effort to identify cultural heritage resources a ethno-historic study and interviews with tribes may become necessary prior to implementing such proposed projects. Although such RDEP projects may not occur on lands deemed sensitive to the White Mountain Apache tribe, we recommend early consultation should areas adjacent to the Apache's four sacred mountains be subjected to such RDEP projects. These mountains would include the San Francisco Peaks, Mt. Baldy, Sierra Madres, and Mt. Graham in east central Arizona.

Submission No: RDEP-Drft-0060
Commenter: Beth Rivers, Indigenous Support Coalition of Oregon
Comment: In August of last year Federal agencies signed the Memorandum of Understanding on Environmental Justice and Executive Order 12898, and Secretary Salazar "reaffirm(ed) Interior's Commitment" to EJ in a DOI Press Release on March 29, 2012, providing a link to the DOI Environmental Justice Strategic Plan 2012-2017 which can be found at http://www.doi.gov/pmb/oepc/upload/Final-DOI-EJ-SP-March-27- 2012.pdf.
Among the updated EJ goals are to "ensure minority, low-income, and tribal populations are provided with the opportunity to engage in meaningful involvement in the Department's decision making processes" such as "conduct public meetings, listening sessions, and forums in a manner that is accessible to and inclusive of minority, low-income, and tribal populations" and "provide opportunities for the involvement of minority, low-income, and tribal populations as appropriate early and throughout program and planning activities and NEPA processes", and "establish working partnership with minority, low-income, and tribal populations". Note the language in DOI's 2012-2017 EJ SP repeats the term "tribal populations" rather than tribal government; thus, sending notice to the Navajo Nation or Hopi Tribe does not suffice as involving Indian peoples. (See page 13 on previous EJ Strategy; see pages 14, 16-17 for current EJ goals, measures.)

Submission No: RDEP-Drft-0060
Commenter: Beth Rivers, Indigenous Support Coalition of Oregon
Comment: In fact, there is no longer a Navajo Chapter House on the HPL. Also, the Hopi Tribe has legal jurisdiction, with no obligation or interest in passing along your notification to Dine'h on the HPL. Thus your office has not met the notification requirements of the Department of Interior's National Environmental Policy Act (NEPA) regulations at 43 CFR Part 46 encouraging public participation and community involvement, using the definition of proposed major the challenge to notify and include low-income and minorities, and to address "disproportionate and adverse" environmental impacts on them Federal actions as found in the Council on Environmental Quality's NEPA regulations at 40 CFR 1508.18, nor of Executive Order 12898, which further promotes the need for public participation, with the challenge to notify and include low-income and minorities, and to address "disproportionate and adverse" environmental impacts on them.

Submission No: RDEP-Drft-0004
Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe

Comment: D. The Cultural Resource Evaluation Has Occurred Without Required Government-to-Government Consultation with the Tribe.
BLM has failed to engage in government-to-government consultation with the Tribe regarding impacts from the RDEP. Since no reports have been made to identify cultural resources within the affected lands, the Tribe's ability to comment on the impacts to cultural resources is severely impaired. These failures violate the NHPA and other federal laws.

Environmental Justice

Summary:

If the BLM is going to direct development to non-reservation lands, the impacts of this must be discussed in the environmental justice analysis.

Response:

As noted in the Draft EIS, the RDEP EIS is a programmatic approach to planning allocations across Arizona BLM-administered lands; the descriptions of the affected environment and the analysis in environmental consequences is of sufficient detail to support the programmatic nature of the EIS. As noted in the Draft EIS, "some tribal lands are located adjacent to REDAs, and impacts on these populations would be analyzed prior to site-specific development as appropriate" (Draft EIS pg. 4-34). General impacts from renewable energy actions on low-income and minority populations in the planning area are discussed on pages 4-34 to 4-36 of the Draft EIS. Once an application is under consideration, site-specific descriptions of the area's resources would be included in the NEPA analysis, and particular elements of a project's design would provide the context for specific impacts.

The REDAs are identified for potential development. Development would not be precluded outside of REDAs or on tribal lands. Furthermore, any proposal for an actual project within or outside of the REDA would require due diligence, including NEPA compliance. At this project level of the process, the proposed application boundaries of the projects would be reviewed against the data layers to determine if there are additional issues that could not be recognized at the larger landscape scale, such environmental justice considerations when siting projects.

For future applications that could be proposed (whether inside or outside the REDAs), pre-application meetings are required under the Solar and Wind Energy Programs and would be helpful for a project developed on lands near tribal populations. The BLM and other stakeholders, including tribes, could provide some sense of the potential for significant resources in the area during the pre-application process.

Comments:

Submission No: RDEP-Drft-0020
Commenter: Rebecca A. Loudbear, Colorado River Indian Tribes
Comment: Directing development only to off-reservation areas has the additional consequence of directing economic benefits away from tribes. The jobs, commercial activity, and revenue share that Tribes might otherwise enjoy as willing participants with BLM and developers is categorically denied under the RDEP's DEIS in its current form. This environmental justice consequence of the proposed plan is not even acknowledged in the DEIS, much less addressed. This proposal should be more fully explored through consultation with Arizona tribes.

G.2.27 Vegetation Resources

Summary:

The BLM needs to consider impacts to nominated sites that are vegetated versus fully disturbed and additional cumulative impacts resulting from previous disturbance in areas where vegetation resources have been removed or disturbed.

Response:

Additional analysis has been provided in the cumulative impacts vegetation section (Section 5.3.17) to include effects from other consumptive uses, such as livestock grazing, OHV use, and recreation. Additionally, for the Final EIS all nominated sites have been screened and only those sites that are disturbed or have no known sensitive resources are carried forward as a REDA. This eliminated many sites that have functional vegetative communities or other sensitive resources, including wildlife habitat and HMAs. Site-specific analysis would be conducted on all applications for renewable energy development and would address impacts to vegetation, wildlife, recreation and other applicable resources.

Comments:

Submission No: RDEP-Drft-0007

Commenter: Greta Anderson, Western Watersheds Project

Comment: Any habitats, however marginal, that are lost to solar energy development are being lost in addition to the acres of BLM lands adversely impacted by other consumptive uses such as livestock grazing and off-road vehicle use. Where the REDAs are proposed for previously-disturbed areas, the BLM must also consider the differences between a disturbed-but-vegetated site and an energy development in terms of carbon sequestration, wildlife use, recreation, access, connectivity, and fragmentation.

G.2.28 Water

Affected Environment

Summary:

The BLM should clarify ADWRs authority to regulate groundwater use in AMAs, INAs, and the rest of the state.

Response:

The BLM agrees that ADWR's authority role in water permitting should be clarified. The following text has been included in Section 4.2.23 of the Final EIS: "Groundwater use from groundwater-supply extraction wells located in AMAs would be subject to review and approval by the ADWR. For areas outside AMAs, including in INAs, BLM priority watershed, and sole source aquifers, the ADWR will ensure proposed wells are designed and constructed to prevent aquifer contamination."

Comments:

Submission No: RDEP-Drft-0001

Commenter: Michael J. Lacey, Arizona Division of Water Resources

Comment: 1. The document contains numerous references to ADWR's authorities to regulate groundwater use inside Active Management Areas (AMAs), Irrigation Non-Expansion Areas (INAs), and in the balance of the State. In general, our regulatory authority over groundwater use in the areas of the State outside of the AMAs is limited to ensuring that wells are drilled pursuant to permits issued by the Department and are constructed to minimum

standards to prevent aquifer contamination from surface spills and cross contamination between aquifer units. ADWR has no authority to conduct well impact analyses, or conduct any reviews as to legal access or the appropriateness of groundwater use pursuant to such well permits1,2. Footnotes: 1 ADWR regulates groundwater use within AMAs and has limited authority over the use of groundwater for industrial purposes (including power production) in the Harquahala INA. Upon a water adequacy election of local platting authorities, ADWR has additional authority over groundwater use for subdivision growth outside of AMAs. This language "Any proposed groundwater –supply extraction wells, including proposed wells in the AMAs, INAs, BLM priority watersheds, and sole source aquifers would be subject to review and approval by the ADWR." contained in the discussion of the potential environmental consequences of the alternatives is overly broad and, in the Department's opinion, implies a degree of protection against undesirable environmental consequences from the use of groundwater that may not exist in large portions of the State, notably in much of the areas that are the focus of BLM's report.

Design Features

Summary:

The BLM should consider only non-thermal PV solar panels as a design feature in the water alternative.

Response:

Guidance regarding solar thermal technology and water consumption was incorporated into the Final EIS. Specifically, Section 4.2.23 of the Final EIS now notes that the BLM would not permit utility scale solar thermal facilities unless it could be demonstrated that no significant impacts would occur on the applicable hydrologic system. Additionally, the additional Water Protection Zones described in the Water Alternative and incorporated into the Proposed Alternative are arranged hierarchically, with WPZs 2 and 3 adding increasingly strict design features in addition to those defined in Appendix B, Design Features, such as annual consumption of a renewable energy development would not exceed 55 acre-feet per year (WPZ 3 design feature).Appendix B, Design Features and Best Management Practices, in RDEP's Final EIS and Appendix A, Section A.2.2.10, in the Solar Final PEIS describe design features to avoid, mitigate, or minimize impacts on water resources from solar development.

The RDEP Draft EIS also addresses potential impacts on water resources resulting from solar energy development and proposes a set of design features common to all action alternatives. Appendix B, Design Features and Best Management Practices, Table B-1, Design Features, identifies 229 general measures to avoid or mitigate adverse impacts on all resource areas. Design feature numbers 59, 167-171, and 179 address water resources directly. In particular, design feature number 167 specifies that solar project developers "shall plan to implement water conservation measures…in order to reduce project water requirements…for example, using dry cooling…or selecting solar energy technologies that do not require cooling water." Design feature number 59 further advises that proponents of proposed solar facilities consider the capability of local surface or groundwater supplies to provide adequate water for operation and that water supply be considered early during project siting and design. Section 4.2.23, page 4-165, of the DEIS, notes that additional more detailed analysis and subsequent mitigation measures beyond those specified in Appendix B could be required during the ROW authorization and facility siting process.

Comments:

Submission No: RDEP-Drft-0046

Commenter: David Grieshop

Comment: Type of PV panels. I would encourage use of non-thermal solar panels generation given the two sites contain sufficient acreage to construction megawatt installations. Why? Non-thermal solar panels do not require water to produce steam. Water is an issue in the Sierra Vista sub watershed given the Congressional mandate for sustainable water yield; potential threat to Fort Huachuca; and future managed growth.

G.2.29 Wildlife

Design Features

Summary:

The BLM should eliminate the translocation of wildlife design feature as it would be detrimental to sensitive species.

Response:

Both the Solar Final EIS and RDEP Final EIS include the potential for translocating special status species. Any translocation would be planned and conducted in coordination with appropriate federal and state agencies and would include post-translocation monitoring. No change to the document has been made.

Comments:

Submission No: RDEP-Drft-0007

Commenter: Greta Anderson, Western Watersheds Project

Comment: BLM's design features for the RDEP include translocation of sensitive wildlife and plant species. DEIS at B-14. This fails to address the fact that many species do not survive or thrive or adapt to translocation. The BLM must limit the extent to which energy development displaces species and cannot merely plan to move the species.

Impact Analysis

Summary:

The DEIS does not analyze the anticipated impacts on wildlife species and provides only general qualitative estimates of impact that do not allow for quantitative or objective evaluation by the public. Improved and additional impact analysis is needed on bird and bat collisions with guywires in wind energy developments, tortoise, flat-tailed horned lizards, and migratory birds, including bird mortality from several causes.

Response:

It is also important to recognize that the REDAs are identified for potential development. Any proposal for an actual project would require due diligence, including NEPA compliance. At this project level of the process, the proposed application boundaries of the projects would be reviewed against the data layers to determine if there were additional issues that could not be recognized at the larger landscape scale. Of particular note are sensitive species and cultural resources that require mandated consultations.

Through the NEPA analysis, the BLM has complied with its Special Status Species policy and would not violate the Migratory Bird Treaty Act or Endangered Species Act. Due to the programmatic nature of the document, a species-by-species analysis was not conducted for sensitive or non-sensitive species within the REDAs. Impacts on many non-sensitive and most sensitive species would be reduced to the

greatest extent possible by avoiding numerous wildlife habitats (Table 2-1, e.g., AGFD Areas of Conservation Potential, special status species locations, wildlife corridors, USFWS critical habitat, BLM sensitive species habitat, desert tortoise habitat categories I, II, and III) and by implementing design features and BMPs (Appendix B). A more detailed species-specific analysis would be conducted during the NEPA analysis at the project level. Additional information on wind (meterological towers and guy wires) and solar (temperature changes) has been incorporated into the Chapter 4 analysis for fish and wildlife. According to these comments, changes were made in Section 4.2.6, Fish and Wildlife, under the Migratory Birds heading. On page 4-40 of the DEIS, the BLM addresses the impacts of roads on wildlife (including desert tortoise); this text will not be modified: "Although disturbance would generally be reduced compared to construction, human presence, traffic on access roads, fugitive dust, site lighting, operational noise from equipment, and erosion and sedimentation would continue to affect animals on and off the site, resulting in avoidance or reduction in use of an area larger than the project footprint." Any species that become listed under the Endangered Species Act in the future would be added to the REDA screening criteria and REDAs would be adjusted accordingly.

Comments:

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: Defenders seeks a clearer understanding of the potential impacts of RDEP alternatives on Arizona's wildlife communities from RDEP's "nominated sites", proposed Renewable Energy Development Areas (REDAs) and Agua Caliente Solar Energy Zone (SEZ). The DEIS does not provide any analysis of the anticipated impacts to specific wildlife species, and provides only general, qualitative estimates of impact that do not allow for quantitative or objective evaluation by the public. Furthermore, given the composite2 nature of the BLM's Special Status Species and Critical Habitat layers, as well as the AGFD's Species and Habitat Conservation Guide, we are unable to use these layers to understand how specific species might be impacted by the various alternatives.

Submission No: RDEP-Drft-0070
Commenter: Kay Sibary
Comment: Bat Conservation International has been working to identify ways wind energy can be operated to reduce the high number of wildlife killed by turbines. I hope you and the BLM plans will take these issues into account so that we don't aggravated an already serious environmental issue.

Submission No: RDEP-Drft-0053
Commenter: Steven L. Spangle, US Fish and Wildlife Service
Comment: Page 4-41, 2"d paragraph - Bird and bat collision with permanent meteorological towers, especially those supported by guy wires as opposed to free standing, is an issue at wind energy projects in addition to collisions with turbines and blade strikes.

Submission No: RDEP-Drft-0004
Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe
Comment: The DEIS also fails to adequately address the cumulative impacts on the flat-tailed horned lizard (FTHL). There is no analysis of the environmental effects of other, related projects on the FTHL, nor any discussion of the interaction of related projects and future projects under the RDEP. Such a cursory analysis violates NEPA. Brong, 492 F.3d at 1133.

Submission No: RDEP-Drft-0004
Commenter: Thane D. Sommerville, Attorney for the Quechan Tribe
Comment: F. The RDEP Will Have Unacceptable Impacts on the Flat-Tailed Horned Lizard.
The DEIS acknowledges that the desert scrub habitat within and near the SEZ could provide habitat for the FTHL. Environmental Consequences (Special Status Species), 4-124. The Tribe deeply values the

FTHL, as it is part of the Tribe's creation story. The DEIS fails to specifically describe the risks to the FTHL, but notes that the greatest risk would be to animals with limited mobility, such as small reptiles. Environmental Consequences (Fish and Wildlife), 4-38. This adds to the Tribe's dissatisfaction with the Agua Caliente SEZ proposal.

The DEIS notes that the SEZ would result in removal and fragmentation of wildlife habitat in the southern part of the Palomas Plain WHA. The DEIS is inadequate in that it does not describe any mitigation features specific to the FTHL. Rather, it states that design features and best management practices would reduce habitat loss and fragmentation. Id. at 4-44. The section on design features and best practices, however, does not address the FTHL. Moreover, the Flat-tailed Horned Lizard Rangewide Management Strategy states that once FTHLs are relocated to another area, their mortality rate often increases due to the change in environment. Thus, while removal of lizards may avoid direct mortality resulting from construction and operation of the ROEP, it may lead to indirect mortality based on habitat change. Such a risk to an already dwindling population is unacceptable.

Submission No: RDEP-Drft-0007

Commenter: Greta Anderson, Western Watersheds Project

Comment: A number of the REDAs are within desert tortoise habitat and the impacts of additional infrastructure and road traffic in these areas should be assessed. Increased roads and road use may increase road kills of desert tortoises, increase spread of invasive weeds that modify desert tortoise habitat, result in increased road-kill facilitating localized population increases of predatory ravens and coyotes, and may result in increased poaching of desert tortoises (Grandmaison and Frary, 2012). The desert tortoise is a candidate species for listing under the Endangered Species Act. A 2011 settlement agreement requires the USFWS to reconsider the candidate status for the tortoise by 2015. The BLM cannot commit tortoise habitat to permanent destruction in advance of that deadline without weighty consideration of the impacts, and many of the REDAs will need to be reconsidered. Without this, the BLM's action here may propel the full listing of the species.

Submission No: RDEP-Drft-0007

Commenter: Greta Anderson, Western Watersheds Project

Comment: The DEIS and the BLM in general underestimates the impact of solar and wind energy development on birds protected under the migratory bird treaty act. The RDEP describes the impacts of Alternative 1 as "negligible" on migratory birds. DEIS at 4-43. This conclusion is based on the inclusion of certain design features that are identified in Appendix B. Unfortunately, those design features fail to account for the fact that birds and bats are highly mobile, don't stay strictly within riparian habitats or wetlands (#45), migratory corridors (#46), or "known" flight paths (#54). Solar developments should not be sited in close proximity to open water or agricultural fields to reduce their impact on birds (McCrary et al., 1986).

The design features include avian impact monitoring but do not describe what happens when monitoring reveals high levels of impacts. The BLM must make a firm commitment to shut energy developments down when mortality cannot be mitigated or reaches a certain level of "take." The DEIS says that met towers will be periodically inspected but no firm protocol is established. DEIS at B-12. The DEIS does not address the high temperatures at solar sites and the impacts on avifauna that this intense heat generation can have.

Tiering from the Solar Programmatic Environmental Impact Statement

<u>Summary:</u>

The BLM should incorporate a more robust analysis of impacts on wildlife and the correct ecological scale, rather than using the Draft Solar PEIS analysis.

Response:

While the RDEP EIS relies on the Solar PEIS for general information on utility-scale solar developments, the analysis provided is resource and Arizona specific. As noted in the Solar EIS, the RDEP EIS is a programmatic approach to planning allocations across Arizona BLM-administered lands; the descriptions of the affected environment and the analysis in environmental consequences is of sufficient detail to support the programmatic nature of the EIS. Impacts associated with renewable energy were generally described in Section 4.2.6, Wildlife. Once an application is under consideration, site-specific descriptions of the area's resources would be included in the NEPA analysis, and particular elements of a project's design would provide the context for specific impacts.

It is also important to recognize that the REDAs are identified for potential development. Any proposal for an actual project would require due diligence, including NEPA compliance. At this project level of the process, the proposed application boundaries of the projects would be reviewed against the data layers to determine if there are additional issues that could not be recognized at the larger landscape scale. Of particular note are protected species that require mandated consultations.

For future applications that could be proposed (whether inside or outside the REDAs), pre-application meetings are required under the Solar and Wind Energy Programs and will help determine any sensitive wildlife resources that may be present within the project area. The BLM and other stakeholders, including AGFD and the USFWS, would provide some sense of the potential for significant resources in the area during the pre-application process.

Comments:

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: While we do support the approach of utilizing properly selected and applied wildlife screens, we do not believe utilizing Draft Solar PEIS wildlife impacts analysis by reference is sufficient for RDEP, which is intended to be a "step-down" analysis from the Draft Solar PEIS. The Draft Solar PEIS does not incorporate in-depth analysis of likely environmental consequences to specific resources from utility-scale solar energy development. This type of analysis does not constitute a "hard look" at the direct, indirect, and cumulative impacts to resources and uses of the public lands which could support permitting of projects. The BLM must incorporate a more robust analysis of impacts on wildlife at the correct ecological scale to ensure development is consistent with the intent of RDEP.

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: As noted in the DEIS, "Impacts on wildlife from utility-scale solar are described in the Draft Solar PEIS (Section 5.10, Table 5.10-2) and incorporated here by reference (BLM and DOE 2010)." (DEIS p 4-38). Unfortunately, the Draft Solar PEIS does not incorporate in-depth analysis of likely environmental consequences to specific resources from utility-scale solar energy development. As noted in Chapter 5 of the Draft Solar PEIS, the intent of the analyses presented is "to describe a broad possible range of impacts for individual solar facilities, associated transmission facilities, and other off-site infrastructure that might be required to support utility-scale solar energy development. DPEIS, p. 5-1 (emphasis added). This type of analysis does not constitute a "hard look" at the direct, indirect, and cumulative impacts to resources and uses of the public lands which could support permitting of projects. The BLM must incorporate a more robust analysis of impacts on wildlife at the correct ecological scale to ensure development is consistent with the intent of RDEP.

Mitigation Measures

Summary:

The BLM needs to explain what mitigation measures are in place to protect wildlife habitat and sensitive species and should also standardize monitoring protocols and landscape level conservation strategies as part of the mitigation measures. Some additional mitigation measures should include a measure that would require avoiding future USFWS wildlife corridors and measures that address habitat fragmentation and genetic flow between species populations.

Response:

Design features, required plans, and BMPs as presented in Appendix B would be implemented for solar and wind energy development. Monitoring protocols are established by BLM and state and federal agencies, and the Arizona Comprehensive Wildlife Conservation Strategy (AGFD 2006) would be implemented. The Final EIS REDA screening process has been updated to include additional information from the AGFD, including the Species and Habitat Conservation Guide data, teirs 4, 5 and 6. Tiers 1, 2 and 3 are used in updated analysis in Chapter 4. Any proposal for a wind or solar energy project will still require site specific permitting, additional environmental analysis, and NEPA compliance.

The environmental review of site-specific projects proposed in a REDA or SEZ could be facilitated by incorporating the analysis of this EIS, the Solar PEIS (BLM and DOE 2012a), and Wind PEIS (BLM 2005b). However, for site specific applications, the BLM will continue to look at new information and analyses including the Ecoregional Assessments and the LCC efforts as well as other information as they assess project proposals. Additionally, the regional mitigation planning that will follow as part of the commitments in the Solar PEIS may contribute additional mitigation measures and/or practices. Regional Mitigation Planning is currently being piloted by the national Solar Program and is discussed in detail in the Solar Final PEIS (see Section A.2.5 of Appendix A of the Final Solar PEIS). Should a Regional Mitigation Plan become an effective tool, then they BLM Arizona will determine how best to apply it to SEZs and REDAs.

Comments:

Submission No: RDEP-Drft-0032

Commenter: Joe Melton

Comment: 1. The area contains many dry river beds that originate in the KOFA Mountains, the Little Horns, the Eagle Tails, and other ranges and all drain into and through the proposed study areas to the Gila River. These are all vital travel routes for wildlife. The summer rains run water down these dry river beds greening up these routes for the necessary forage and travel route for our existing deer and sheep herds. These routes are extremely important for our wildlife to travel and find the ""green ups"" along these routes. What plans are included in the EIS to protect these vital areas from closure.

2. These areas also contain the most prolific breeding area in southern Arizona for our beautiful bobcat populations and a growing Mountain Lion population. The cats also travel these vital corridors and depend on the prey species that utilize these green up areas. What plans in the EIS are included to protect not only the corridors but the flood plane from the Gila River to the mouth of these dry river beds?

Submission No: RDEP-Drft-0006

Commenter: Alex Daue, The Wilderness Society

Comment: Additionally, to evaluate the cumulative impacts on species and other resources, and to compare impacts of different solar projects, locations and technologies, monitoring protocols

should be standardized within the appropriate biological scale for all projects, including transmission and related substations. Some protocols may need to be tailored (and thus different) for different ecosystems, watersheds or species. All monitoring data should be made publicly available in data sets with a common format (recommended by leading scientists who want to conduct studies) that may be easily downloaded and utilized by researchers and the public at large. This transparency will enable timely and robust evaluation of program impacts, efficacy of mitigation measures, and full engagement of the scientific community.

Submission No: RDEP-Drft-0052

Commenter: Ginger Ritter, Arizona Game and Fish Department

Comment: Lastly, the Department recommends including language that references the work the Department is doing to preserve wildlife connectivity. Specifically, it should state that as wildlife corridors are developed by the Department, these areas should be avoided to preserve connectivity. This is particularly important along I-8 where several acres of habitat have been identified as REDAs. If this area were to be developed without the consideration of wildlife movement corridors, the associated infrastructure would create movement barriers. These barriers would isolate wildlife and their habitat, increase the likelihood of species mortality, and restrict the ability of animals to move between important undeveloped regions of the state. Loss of this movement and permeability would result in the fragmentation of populations, prevent wildlife from accessing resources, finding mates, reduce gene flow, and prevent wildlife from re-colonizing areas where local extirpations may have occurred. Thus, the Department strongly encourages the inclusion of this language. It would meet the needs of the Department by ensuring that projects are sited in appropriate areas with low resource conflict and minimize impacts to wildlife and their habitats.

Submission No: RDEP-Drft-0010

Commenter: John Shepard, Arizona Solar Working Group

Comment: Additionally, to evaluate the cumulative impacts on species and other resources, and to compare impacts of different solar projects, locations and technologies, monitoring protocols should be standardized within the appropriate biological scale for all projects, including transmission and related substations. Some protocols may need to be tailored (and thus different) for different ecosystems, watersheds or species. All monitoring data should be made publicly available in data sets with a common format (recommended by leading scientists who want to conduct studies) that may be easily downloaded and utilized by researchers and the public at large. This transparency will enable timely and robust evaluation of program impacts, efficacy of mitigation measures, and full engagement of the scientific community.

Submission No: RDEP-Drft-0071

Commenter: Jamie Rappaport Clark, Defenders of Wildlife

Comment: Additionally, to evaluate the cumulative impacts on species and other resources, and to compare impacts of different solar projects, locations and technologies, monitoring protocols should be standardized within the appropriate biological scale for all projects, including transmission and related substations. Some protocols may need to be tailored (and thus different) for different ecosystems, watersheds or species. All monitoring data should be made publicly available in data sets with a common format (recommended by leading scientists who want to conduct studies) that may be easily downloaded and utilized by researchers and the public at large. This transparency will enable timely and robust evaluation of program impacts, efficacy of mitigation measures, and full engagement of the scientific community.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: b. Establish baseline ecological data
The BLM and other federal and state agencies and non-profit organizations have conducted regional ecosystem and resource assessments that provide the foundation for evaluating baseline resource conditions, identifying stressors and their impacts, and establishing conservation strategies for protecting and restoring wildlife, habitat, and important natural resources. In particular, BLM recently detailed how it proposes to integrate the new Adaptive Inventory and Management (AIM) framework into the Solar Program, using it as a foundation upon which to add solar energy-specific elements. Using this baseline ecological information, landscape-level (e.g., ecoregional or watershed level) conservation strategies should be developed to achieve specific wildlife management objectives. It is important that BLM recognize that impacts on wildlife are not uniform.

Submission No: RDEP-Drft-0010
Commenter: John Shepard, Arizona Solar Working Group
Comment: c. Determine conservation/wildlife management impacts, objectives, and priorities
All mitigation should be directly related to broader regional conservation plans. To achieve this over the long term, the BLM should first consider existing State Wildlife Action Plans (SWAPS), current BLM wildlife management requirements and policies, existing RMPs, and other relevant regional or local conservation plans. In addition, the BLM should work collaboratively with appropriate Landscape Conservation Cooperatives to obtain the benefit of local and regional knowledge regarding resource conditions and current wildlife management goals and strategies, as well as incorporating strategies for climate adaptation into specific regional mitigation plans. The BLM and the FWS should work collaboratively to define a clear set of shared conservation priorities that guide decisions about where to develop and where to invest in conservation and/or restoration in the context of existing wildlife management strategies. Offset investments should be in priority conservation areas as determined by state wildlife action plans and decision support tools, regional conservation strategies, recovery plans, The Nature Conservancy ecoregional assessments, or other credible analysis or plans that identify areas of greatest ecological significance and opportunities for ecological restoration consistent with efforts to mitigate project impacts on specific species and habitats.

Submission No: RDEP-Drft-0006
Commenter: Alex Daue, The Wilderness Society
Comment: The BLM and other federal and state agencies and non-profit organizations have conducted regional ecosystem and resource assessments that provide the foundation for evaluating baseline resource conditions, identifying stressors and their impacts, and establishing conservation strategies for protecting and restoring wildlife, habitat, and important natural resources. In particular, BLM recently detailed how they propose to integrate the new Adaptive Inventory and Management (AIM) framework into the Solar Program, using it as a foundation upon which to add solar energy-specific elements. Using this baseline ecological information, landscape-level (e.g., ecoregional or watershed level) conservation strategies should be developed to achieve specific wildlife management objectives. It is important that BLM recognize that impacts on wildlife are not uniform.

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Commenter: Jamie Rappaport Clark, Defenders of Wildlife
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The BLM and other federal and state agencies and non-profit organizations have conducted regional ecosystem and resource assessments that provide the foundation for evaluating baseline resource conditions, identifying stressors and their impacts, and establishing conservation strategies for protecting and restoring wildlife, habitat, and important natural resources. In particular, BLM recently detailed how it proposes to integrate the

new Adaptive Inventory and Management (AIM) framework into the Solar Program, using it as a foundation upon which to add solar energy-specific elements. Using this baseline ecological information, landscape-level (e.g., ecoregional or watershed level) conservation strategies should be developed to achieve specific wildlife management objectives. It is important that BLM recognize that impacts on wildlife are not uniform.

Submission No: RDEP-Drft-0006
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Comment: All mitigation should be directly related to broader regional conservation plans. To achieve this over the long term, the BLM should first consider existing State Wildlife Action Plans (SWAPS), current BLM wildlife management requirements and policies, existing RMPs, and other relevant regional or local conservation plans. In addition, the BLM should work collaboratively with appropriate Landscape Conservation Cooperatives to obtain the benefit of local and regional knowledge regarding resource conditions and current wildlife management goals and strategies, as well as incorporating strategies for climate adaptation into specific regional mitigation plans. The BLM and the FWS should work collaboratively to define a clear set of shared conservation priorities that guide decisions about where to develop and where to invest in conservation and/or restoration in the context of existing wildlife management strategies. Offset investments should be in priority conservation areas as determined by state wildlife action plans and decision support tools, regional conservation strategies, recovery plans, Nature Conservancy ecoregional assessments, or other credible analysis or plans that identify areas of greatest ecological significance and opportunities for ecological restoration consistent with efforts to mitigate project impacts on specific species and habitats.

Submission No: RDEP-Drft-0071
Commenter: Jamie Rappaport Clark, Defenders of Wildlife
Comment: c. Determine conservation/wildlife management impacts, objectives, and priorities
All mitigation should be directly related to broader regional conservation plans. To achieve this over the long term, the BLM should first consider existing State Wildlife Action Plans (SWAPS), current BLM wildlife management requirements and policies, existing RMPs, and other relevant regional or local conservation plans. In addition, the BLM should work collaboratively with appropriate Landscape Conservation Cooperatives to obtain the benefit of local and regional knowledge regarding resource conditions and current wildlife management goals and strategies, as well as incorporating strategies for climate adaptation into specific regional mitigation plans. The BLM and the FWS should work collaboratively to define a clear set of shared conservation priorities that guide decisions about where to develop and where to invest in conservation and/or restoration in the context of existing wildlife management strategies. Offset investments should be in priority conservation areas as determined by state wildlife action plans and decision support tools, regional conservation strategies, recovery plans, The Nature Conservancy ecoregional assessments, or other credible analysis or plans that identify areas of greatest ecological significance and opportunities for ecological restoration consistent with efforts to mitigate project impacts on specific species and habitats.

Submission No: RDEP-Drft-0007
Commenter: Greta Anderson, Western Watersheds Project
Comment: The RDEP and the Agua Caliente SEZ create these barriers to genetic flow. Design features in Appendix B do nothing to address this and the only tortoise-specific design element pertains to capping pipes, etc. DEIS at B-14. We support the requirement to cap pipes and urge it to include all diameters, given the tiny size of juvenile tortoises. However, this does nothing to mitigate the impacts to tortoises that could occur from the species cross-country movement or to their burrows.

G.3 Commenter Lists

G.3.1 Individual Submission Commenter List

Name	Affiliation	Submission Number
Mark T. Altaha	White Mountain Apache Tribe Historic Preservation Office	RDEP-Drft-0041
James Ammons		RDEP-Drft-0035
Greta Anderson	Western Watersheds Project	RDEP-Drft-0007
Sherry Appleby		RDEP-Drft-0034
Diane L. Arnst	Arizona Department of Environmental Quality, Air Quality Division	RDEP-Drft-0059
Maria Baier	Arizona State Land Department	RDEP-Drft-0002
John Bathke, Historic Preservation Officer for the Quechan Indian Tribe	Public Meeting Transcripts - Yuma, AZ	RDEP-Drft-0018
Douglas Beach		RDEP-Drft-0045
Stu Bengson	AZ BLM RAC member	RDEP-Drft-0038
Kirk Brus	Army Corps of Engineers	RDEP-Drft-0042
Bob Cassidy		RDEP-Drft-0026
Larry L. Clark	Clark Enterprises	RDEP-Drft-0072
Matt Clark, Defenders of Wildlife	Public Meeting Transcripts - Phoenix, AZ	RDEP-Drft-0015
Mike Daily		RDEP-Drft-0027
Alex Daue	The Wilderness Society	RDEP-Drft-0006
Katherine Gensler	Solar Energy Industries Association	RDEP-Drft-0005
Betty Ghedini		RDEP-Drft-0040
Betty Ghedini		RDEP-Drft-0044
Kathleen M. Goforth	Environmental Protection Agency, Environmental Review Office	RDEP-Drft-0062
Mark Hayduke Grenard		RDEP-Drft-0012
David Grieshop		RDEP-Drft-0046
Dr. Annita Harlan		RDEP-Drft-0067
Buster Johnson	Mohave County Board of Supervisors	RDEP-Drft-0058
Barbara Jordan		RDEP-Drft-0054
MGySgt Gary Kaitting, USMC (ret.)		RDEP-Drft-0063
Sarah King	Arizona Interfaith Power & Light	RDEP-Drft-0013
Michael J. Lacey	Arizona Department of Water Resources	RDEP-Drft-0001

Name	Affiliation	Submission Number
Christopher Lish		RDEP-Drft-0025
Kathy Lopez		RDEP-Drft-0031
Rebecca A. Loudbear	Colorado River Indian Tribes	RDEP-Drft-0020
Robert Mark, Rupestrian Cyber Services	Public Meeting Transcripts - Flagstaff, AZ	RDEP-Drft-0016
Rob Marshall, MFS	The Nature Conservancy	RDEP-Drft-0009
Andrea Martinez		RDEP-Drft-0021
Paul Melcher	Department of Development Services	RDEP-Drft-0008
Joe Melton		RDEP-Drft-0032
Dr. John Nishio		RDEP-Drft-0069
Amanda Ormond	Interwest Energy Alliance	RDEP-Drft-0003
Jean Public		RDEP-Drft-0050
Jamie Rappaport Clark	Defenders of Wildlife	RDEP-Drft-0071
George Reiners		RDEP-Drft-0048
Ginger Ritter	Arizona Game and Fish Department	RDEP-Drft-0052
Beth Rivers	Indigenous Support Coalition of Oregon	RDEP-Drft-0060
Katherine Rose and Audrey Werth		RDEP-Drft-0056
Joseph Paul Ruttle		RDEP-Drft-0028
Steve Saway		RDEP-Drft-0024
Jana Selk		RDEP-Drft-0014
John Shepard	Arizona Solar Working Group	RDEP-Drft-0010
Kay Sibary		RDEP-Drft-0070
Sidney Silliman, Ph.D.	Desert Tortoise Council	RDEP-Drft-0011
Bill Sims	4V Rod and Gun Club	RDEP-Drft-0055
Kenneth L. Sizemore	Five County Association of Governments	RDEP-Drft-0047
Alexander B. Smith	Bureau of Reclamation, Environmental Resource Management Division	RDEP-Drft-0061
Larry Snead		RDEP-Drft-0039
Thane D. Sommerville	Attorney for the Quechan Tribe	RDEP-Drft-0004
Steven L. Spangle	US Fish and Wildlife Service	RDEP-Drft-0053
Jerry Stabley	Pinal County Planning and Development	RDEP-Drft-0064
Linda Taunt	Arizona Department of Environmental Quality	RDEP-Drft-0037
Karl Taylor	Mohave County Public Works	RDEP-Drft-0043
Tom Taylor		RDEP-Drft-0036

Name	Affiliation	Submission Number
Jeanie Watkins		RDEP-Drft-0033
Elizabeth Webb		RDEP-Drft-0022
Elizabeth Webb		RDEP-Drft-0023
John Wessels	National Park Service	RDEP-Drft-0066
Matthew D Williamson CIV	US Army Garrison Yuma	RDEP-Drft-0030
Jean E. Wilson		RDEP-Drft-0029
Kathy Wittstock	Yavapai County Assessor's Office	RDEP-Drft-0049
Robert Zittle		RDEP-Drft-0057
	Public Meeting Transcripts - Kingman, AZ	RDEP-Drft-0017
	Public Meeting Transcripts - Tucson, AZ	RDEP-Drft-0019
	The Wilderness Society (campaign letter)	RDEP-Drft-0065

G.3.2 Campaign Letter Commenter List

Last Name	First Name
A	Aimee
Abbott	Mary
Able	Mary
Abramova	Inna
Abrams	Sally
Abrantes	Elizabeth
Adam	Margaret
Adams	Andrea
Adams	David
Adams	Eileen
Adams	JT
Adams	Spencer
Adams	Margaret
Adeina	Dalia
Adrian	Judith
Agostini	Luisa
Agovino	Christie
Aguilera	Marco
Aguirre	Gloria
Akey	David
Akin	Ray
Albertson	Pat
Alcock	John
Alderette	Gary
Alderson	George & Frances
Aldredge	Sharon
Aldrich	Verna
Alexander	Emily
Alexander	Kate
Alexander	Matthew
Alexander	Thomas
Alger	Jacqueline
Allan	David
Alldredge	Liza
Allen	Beth
Allen	Bruce
Allen	Dennis
Allen	Kelly
Allen	Ramona
Allen	Susan
Allen	Cat
Allison	Elaine
Almack	Charles

Last Name	First Name
Alonso	Shelley
Alpert	Dave
Altamirano	Andrew
Alter	Judith
Altman	Jason
Alzuro	Hernan
Amaral	Cynthia
Amato	Julie
Amato	Nicole
Ambrose	Karen
Ambroziak	Megan
Ames	Desiree
Ameson	Andrew
Amodeo	James
Amoroso	Isabella
Amsden	Liz
Andarmani	Kristine
Andersen	Janis
Anderson	Carol
Anderson	David
Anderson	Evette
Anderson	Henry
Anderson	Joan
Anderson	John H.
Anderson	Patricia & Donald
Anderson	Wayne
Anderssen	Saliane
Andrade	Paul
Andre	James
Andreani	Mary
Andreas	Leticia
Andrew	S.
Andrews	Frank G.
Andrews	Leslie
Andrews	Phyllis
Andreyo	Melissa
Angelesco	F
Anger	Robert
Anisman	Martin
Ansell	Martin
Anson	Gina
Anthony	Mary
Anthony	Nicholas

Last Name	First Name
Antone	Mike
Antonel	Stacy
Antonopoulos	Georgia
Apgar	Susan
Appelbaum	Philip
Arace	Marylucia
Arago	Marybeth
Aram	Susan
Archer	Tracey
Archuleta	Patricia
Arcure	Anthony
Arevalo	Ana
Armani	Debra
Armer	Brian
Armer	Joan & Paul
Armigo	Victoria
Armitage	Tami
Armstrong	Ellen
Armstrong	John
Arn	Anthony
Arnold	Alison
Aronson	Robert
Arquilla	Vance
Arteaga	Siria
Arthur IV	Richard
Arumugham	Vinu
Arutunian	Mary
Asbury	Luke
Ashton	Chris
Ashton	Joan
Atkins	Ed
Atos	Geraldine
Auerbach	Shirley
August	Boyer C.
Auman	Rick
Ausman	Emma
Austin	B.
Austin	Jana
Austring	Dee
Avellan	Jennifer
Avila	Elizabeth
Avila	Ron
Avila	Steve
Axt	Benjamin
Ayala	John

Last Name	First Name
Aycock	Christopher
Aylward	David
Babbini	Paul
Babcock	Clay
Babcock	Helen
Babcock	Karen
Babst	Christina
Bachelder	Matt
Bacina	Marla
Bacom	Tommy
Badawy	Nabila
Bader	Susanne
Baekey	Anita
Bahn	Sarah
Bailey	Elizabeth
Bailey	Mark
Bailey	Melinda
Bair	Marilyn
Baker	Beth
Baker	David
Baker	Kelsey
Baker	Pat
Baker	Paula
Balassi	Nancy
Baldwin	Valerie
Baldwin	Bruce
Baldwin	Lee
Balgemann	Elaine
Ballak	Jonathan
Ballen	Lee
Balog	Ranko
Baltin	Brian
Balzan	Darlene
Bandell	K.
Banever	Carol
Banever	Robert
Bankie	Brett
Banks	Michele
Banzhaf	Joyce
Barbato	Allice
Barbeau	Clayton
Barberini	Bernadette
Bardsley	Jacqueline
Barger	Denise
Barhoum	Christopher

Last Name	First Name
Barker	Eddie
Barkow	Carolyn
Barlow	Scott
Barlow	Stephanie
Barnard	Jeff
Barnes	David
Barnes	Leonie
Barnhart	S.
Barondes	Lynda
Barone	Sharon
Barranti	Chrys
Barrett	Dennis
Barrett	Jill
Barrett	Keiko
Barrett	Steven
Barrington	Tim
Barron	Art
Barry	Marion
Bartlett	Cindy
Bartlett	R.
Barton	Kimberly
Bartschi	Kiku
Basnar	Lee
Bass	Jennifer
Bassett	Susan
Bassett	Thomas
Bates	Abigail
Bates	Janis
Battaglia	Rosemary
Batten	Candace
Bauer	Ernst
Bauer	Isabel
Bauer	Terri
Baum	Rhona
Baumann	Linda & Paul
Bautista	Melvin
Baxter	Ben
Baxter	Joslyn
Beale	Marjorie
Beard	Pamela
Beattie	Evan
Bechtel	Paul
Bechtold	Carol
Beck	Amanda
Beck	Donald

Last Name	First Name
Beck	Jeffrey
Beckerman	Gary
Beckett	Lillian
Beckett	Suzannea
Beckham	Marie
Beckmann	Annie
Beckwith	Mark
Bednarz	Colleen
Beer	Julie
Bein	Ann
Belew	Lynette
Bell	Marianne
Bellenger	Jayme
Belli	Joseph
Benda	Hilarey
Benjamin	Corey
Bennett	Maris
Bennett	Patricia
Bennigson	Barbara
Bennion	Beth
Benson	Kathy
Benson	Richard
Bentley	Blake
Bentley	Stuart
Bentley	Stuart
Bentsen	Douglas
Berario	Myra
Berg	Hortari
Berg	Ricardo U.
Berg	Vicki L.
Berger	Karen
Berghen	Carol
Bergsma	Debi
Bergstrom	Barbra
Berkel	Cady
Berkel	Jon
Berkhimer	June
Berkshire	David
Berliner	Diane
Bermudez	Sara
Bernee	Ellen
Bernstein	Roslyn
Besancon	Maureen
Bescript	Linda
Bescript	Ruth

Last Name	First Name
Beserra	Jolino
Beshara	Suzanne
Best	Paul
Bettendorf	Lisa
Beverly	J.
Beyer	Dalia
Bhence	Blaze
Bickel	Jeffrey
Bien	Karen
Bigelow	John
Biggs	Warren
Bihler	Chris
Bilotti	Nicole
Binckley	Charles
Binnie	Robert
Binzen	Naomi
Bir	Sherianne
Bircher	K. Kay
Biron	Olivia
Bisbing	Robin
Bishop	Megan
Bishop	Russ
Bissell	Ahrash
Bivens	Dwain
Biwer	Yseult
Black	Celeste
Blackbum	Alice
Blackwell-Marchant	Pat
Blain	Richard
Blair	Jennifer
Blaisdell	Jill
Blakely	Terri
Blandino	Russell
Blanton	Rollin
Blattel	David
Bledsoe	Richard
Bleha	Patricia
Bleken	Anne-Lene
Bleyer	Jon
Bliden	Mich
Bliss	David
Block	Linda
Block	Trent
Blood	Michael

Last Name	First Name
Blueakasha	Rich
Blumberg	Zack
Blumenthal	Harry
Bobo	Orion
Bocchetti	Ralph
Bockian	Edith
Boehm	Marjorie
Boes	Sondra
Bogin	Ronald
Bogios	Constantine
Bohac	Stephen
Bohling	B
Bohn	Linnaea
Bohr	Ron
Boland	Vanessa
Bondoc	Jose Ricardo
Bonnet	Richard
Boone	Jim
Boone	Joseph
Booth	Erik
Borge	Donovan
Bork	Annette
Bosch	Alan
Boschert	Danielle
Bossard	Eudell
Bostock	Vic
Bott	David
Boudriot	Simone
Boughner	Donna
Boulet	Marie
Bourke	Jessie
Bourne	H
Bowers	Barbara
Boyden	Jon
Boyle	Henry
Braaten	Chrys
Brabham	Richard
Braden	Lori
Bradley	Peg
Brady	Anke
Brady	Kathleen
Braithwaite	Kimyn
Bramlage	Laurie
Branca	C.
Branch	Cheryl

Last Name	First Name
Brandon	Linda
Branstetter	Kevin
Brant	Karen
Bratt	Chris
Bratt	Mandy
Braude	Michael
Bray	Angeline
Brazil	Diane
Brazil	Michael
Breazeale	Joseph
Brechenridge	Bonnie
Brechtel	Felicia
Breda	Bo
Breitbard	Susan
Brenner-Ward	Isis
Bresciani	Marchelo
Brewer	Laurel
Briccetti	Eleanor
Bridschge	Mike
Briggs	Kathy
Brigmann	Ria
Brinsley	Chris
Brinton	Valerie
Britt	Cynthia
Britton	Joanne
Broad	Julia
Broadwell	Carolyn
Brock	Jason
Brodkin	Henry
Brooke	Louise
Brooke	Michael
Brooks	Deborah
Brophy	John
Brophy	Tim
Brosh	Linda
Broughton	Margaret
Brousseau	Jeanine
Brown	Damon
Brown	Jeannine
Brown	Jeff
Brown	Lloyd
Brown	Myrna
Brown	Patricia
Brown	Roderick
Brown	Shelly

Last Name	First Name
Brown	Vera
Brown	Elaine
Brown	Lolly
Brown-Ryther	Sherry
Brownwell	Deidre
Bruce	Dorothy
Bruce	Linda
Bruce	Linda
Bruce	Edie
Bruckman	Leonard
Bruhn	Roberta
Bruinen	Maria
Bruker	Dave
Brunell	Barbara
Brunett	Leslie
Bruni	Curzio
Brush	Kim
Bryant	Emily
Bryson	Sarie
Bubala	Louis
Buck	Margaret
Buckwald	Jan
Buhowsky	Joseph
Bui	Khoi
Bumgardner	Terri
Bunch	Van
Burch	Kelly
Burger	Bitsa
Burgess	Melinda
Burgett	Deborah
Burk	Joyce
Burns	Bruce
Burns	Kathryn
Burns	Lyn
Burow	Andy
Burr	James R
Burton	Etta
Bush	Celia
Bustamante	Maria
Bustos	Marty
Bustos	Ray
Butler	C
Byers	Andrea
Byers	Nancy
Cabezas	Maritza

Last Name	First Name
Cabezon	Beatriz
Cabot	Victor
Cadman	Susan
Cadosi Wilson	Annette
Caffejian	Rand
Cage	Ray
Calder	Malcolm
Calder	Tim
Caldwell	Alecto
Calhoun	Charles
Calhoun	Jerry
Cali	Lee
Caliguri	Sabina
Calkins	V.
Call	Connie
Calle	Alfy
Calleja	David
Callsen	Caryl
Calvisi	Ronald
Camacho	Armando
Cambra	Jennifer
Cameron	James
Cameron	Ruth
Cameron	Patrick
Camhi	Gail
Campbell	Dudley & Candace
Campell	Allan
Canfil	Lloyd
Cannara	A
Canning	Ernest
Cantwell	Diane
Caprio	Elen
Caps	Filip
Card-Derr	Geraldine
Cardenas	Dulce
Cardoza	Michael
Carl	Joan
Carlile	N. J.
Carlino	Thomas
Carlos	Rick
Carmona-Mancilla	Laura
Carnahan	Summer
Carney	Marilyn
Caro	Steve

Last Name	First Name
Carolan	Barbara
Carp	David
Carpenter	Gary
Carr	Donna
Carr	Gaile
Carr	John
Carr	Lleni
Carr	Seth
Carrington	Caroline
Carroll	Deborah
Carteno	Roberto
Carter	Sharie
Cartwright	Jennifer
Carvin	Mandy
Casale	Veronica
Case	Ruth
Cass	Mike
Castillo	Robert
Catron	Cheryl
Caughman	Erin
Cenci	Carol
Cencula	David
Chace	Lori
Chacon	Rochelle
Chadwick	Barbra
Chaiklin	Joseph
Chamberlain	Patricia
Chambers	Claire
Chan	Arthur
Chan	B.
Chang	Heather
Charlebois	Stacie
Charnes	Michael
Charney	Danielle
Chavez	Brandon
Chazen	Joyce
Check	Pamela
Cheeseman	Gail
Chen	Allan
Chen	Mich
Chenkin	Cari
Chere III	John
Chianis	Antonia & Andrew
Chidester	Kyle
Child	Katrina

Last Name	First Name
Childs	Pete
Childs	Eunice
Chinn	Karen
Chirpin	Robert
Chittenden	Claudia
Chittenden	David
Chittenden	David
Chiu	Albert
Chlubna	Joseph
Cho	Diana
Chou	Ana
Chow	Josi
Christian	Thomas
Christianson	Mathew
Christina	Linhardt
Christopher	Sandra
Christy	Heather
Chu	Richard
Chung	Gay
Church	Terry
Ciaramella	Susan
Ciardelli	Joanie
Cimarra	Conrad
Cipris	Zeljko
Cira	Kimberly Powell
Cisneros	Tara
Ciuffetelli	L
Clare-Gotch	Janet
Clarida	Christine
Clark	Anne
Clark	Donna
Clark	Irina
Clark	Thomas
Clark	Warren
Clarke	Michael
Clarke-Roberts	Rachel
Clayton	Diane
Clegg	Michael
Clegg	Michael
Clements Owens	Carly
Clemm	Britt
Clemson	G. Scott
Clever	Karoli
Clifford	Ruth
Clift	Julian

Last Name	First Name
Clipka	Mike
Closson	Michael
Clough	Heather
Cloverdal Sumrall	Amber
Cobb	Dan
Cobb	Paul
Cobb	Dean
Coburn	Justin
Cochran	John
Cocking	Kurt
Cockshott	Shiela
Coel	Sara
Cohen	Benita
Cohen	Dan
Cohen	Eleanor
Cohen	Natalie
Cohen	Roy
Cohen	Tyler
Cohn	Barbara
Cole	Anne
Collard	Liz
Collins	Geoffrey
Collins	Gerry
Collins	Sandie
Colton	Lora
Colton	Steve
Columbia	James
Colvig	Lynne
Colwell	Elizabeth
Comell	Michelle
Commons	Judy
Commons	Sandy
Comstock	Michael
Conard	Judy
Confectioner	Vira
Congdon	Russell
Conklin	Kelly
Connick	Cherie
Connolly	Anna
Connor	Elizabeth
Conrad	Jamie
Conrad	Steve
Conradi	Harald
Conroy	Thomas
Contreras	Carlos

Last Name	First Name
Cook	Elizabeth
Cook	Judy
Cook	Michael
Cook	Carol
Coolidge	Anita
Cooper	Elsie
Cooper	Kathleen
Cooper	Ken
Cooper	Leslie
Cooper-Kelley	Penelope
Corcetti	Laura
Cordes	John
Corey	Norma
Corio	Joseph
Corman	Garry
Correlle	Missy
Corriere	Jim
Corrigan	Sean
Costa	Daniel
Costello	Edward
Cotton	Elizabeth
Couch	Charles
Coulter	Huxley
Councilman	Dave
Couvrette	Sharon
Covell	Sandi
Cox	Brent
Coyle	Gregory
Crabb	Jeanne
Craig	Ella
Crane	Donna
Crane	Marcella
Crane	Michael
Crane	Shannon
Crecelius	Cora
Creighton	Peter
Cripps	Phillip
Cronin	David
Crossley	Jean
Crow	Stephanie
Crow	Carolyn
Crown	Alvin
Crum	Cathy
Crusha	Connie
Cruz	Marian

Last Name	First Name
Cubeta	Diana
Cufaude	Tara
Cuff	Kermit
Cugini	Denise
Cullen	Kylie
Cuneo	Sherrell
Cunningham	Alan
Cunningham	Bob
Cunningham	Chris
Curedale	Patrice
Curia	Peter
Curtice	Sean
Curtis	Robert
Cuthbertson	Deirdra
D	Mia
Daei	Bobak
Dahl	Sadi
Dahlstrand	Lucia
Daly	Kevin
Dalzell	Melissa
D'Amico	Dominic
D'Amico	Donna
Dane	William
Daniel	Roger
Danielczyk	Matthew
Daniels	DW
Daniels	Lynda
Daniels	Patricia
Danielson	Sarah A.
Darland	Kathleen
Darling	Chris
Darling	Michael
Darovic	Elizabeth
Date	Sarah
Daugherty	Randall
Davenport	Helen
Davenport	Robert
Davenport	Susan
Davidson	Kathy
Davidson	Michael
Davies	Dorothy L.
Davies	Sue
Davis	Carla
Davis	Ellen
Davis	Frank

Last Name	First Name
Davis	J.
Davis	Patricia
Davis	Ryan
Davis	Vicki
Davis	Vicki
Davison	Jenine
Day	Beverly
De Baca	Sylvia
De Cecco	Jorge
De Costanzo	Danielle
De Dios	Alicia
De Domenico	Ellen
de la Maza	Helen
De Mirjian	Carolyn
DeAngelo	Vic
Dearing	Deb
DeBruton	Noel
DeCianne	Dominic
Decof	Bethany
Dee	D.
Dee	Diana
DeFelice	Paula
Degrigoli	Vito
Dehdashti	Sheedy
DeJong	Joan
Del Prato	Pierre
Delatte	M.
Delgadillo	Arthur
Delgado	Kathleen
Dellas	Merrill
Demirtas	Gail
Deniels	Barbara
Denison	James
Denning	Alison
Dennison	Carolyn
Denny	Wendy
Dentel	Ann
Denton	Jill
Denton	John T.
DePante	Greg
Derenne	Michaela
DeSantis	Richard
Desfor	Paul
Deshayes	Thierry
Desmond	Sheila

Last Name	First Name
Devaney	Kathleen
Devaney	Sean
Devine	Timothy
Dexter	David
Di Sanza	Joseph
Diamond	Wendy
Diaz	Azucena
Diaz	Francisco
Diaz	Michael
Diederichs	Barbara
Dienstbier	Carol
Diermier	Jessica
Dietrich	Cathe
Dille	Samantha
DiMatteo	Richard
Dimitri	Katherine
Disimone	Christine
Dixon	Martha
Dobbins	Timothy
Dobrowitsky	Patrice
Dodge	Dana
Doeppers	James
Dolgin	Gary
Dollar	Ellen
Dollar	Lisa
Domb	Doreen
Domenico	James
Dominguez	Rodrigo
Dominique	Ryba
Donaldson	John R.
Donaldson	Karen
Donato	Donna
Donato	Karlene
Donnadieu	Elisa
Donovan	Charlotte
Donovan	Patrick M.
Dorer	Jeffrey
Dorfman	Nicole
Douglas	Dianne
Douglas	Dianne
Dow	Duncan
Dowe	Flurry
Dowell	Vivian
Dowling	Holly
Dows	Wena

Last Name	First Name
Doyle	Laurence
Doyle	Nikki
Dragavon	Linda
Drake	Susan
Dreste	Arlene
Dreyfuss	Meri
Dubansky	Joshua
Dubois	Courtney
DuCharme	Christy
Dudney	Betty
Duffy	Sharon
Dugaw	Anne
Duke	Carla
Duke	Shawn
Duncan	Erin
Duran	Dani
Duran	Virginia
Durben	Rachel
Duren	Sheri
Durkin	Samuel
Durling	Susan
Dwyer	David
Dwyer	Kathleen
Dykema	Cornelius
Eads	Claudia
Early	Gayle
Earnshaw	Joan
Eaton	Linda
Eaton	Michelle
Eck	JJ
Eckardt	Gerhard
Eckardt	Miriam
Eckardt	Miriam
Economou	Constantina
Eddings	Terri
Edeker	Jeff
Edelen	Byron
Eden	Jonathan
Edge	Dorcas
Edwards	Cathy
Edwards	Jane
Edwards	Jim
Edwards	Kay
Edwards	Mindy
Egle	Chris

Last Name	First Name
Ehresman	Casey
Eichinger	William
Eiseman	Deborah
Eisenberg	Howard
Eitelman	Andrea
Eke	Jocelyn
Eklund	Steve
Ekner	Maret
Elia	Rob
Elkins	Cheryl
Elkins	Lyle
Elkins	David K.
Ellingham	Lewis
Elliot	Alice
Elliott	Julie Heath
Ellis	Robert
Elpers	Mary
Ely	Dennis
Emanuel	Frances
Emerson	Chelsea
Engel	Christine
Engel	Dara
Engelsiepen	Jane
England	Bruce
Ennouri	Elena
Epperson	Leslie Ann
Eppley	Skip
Ercius-DiPaola	Ligia
Erhart	Marla
Erickson	Victoria
Ericson	Dana
Erikson	William
Ernst	Cathie
Escoto	Deborah
Escudero	Ana Cristina Lee
Escudier	Dylan
Esposito	Thomas & June
Espstein	Marc
Esselmann	Tanya
Essex	Michael
Essig	Matilda
Estes	Douglas
Estes	Matthew
Estrada	Laurie
Etheridge	Kelly

Last Name	First Name
Ethington	Ann
Evans	Dinda
Everett	Miranda
Everett	Rosemary
Ewasjet	April
Ewers	Janice
Eyck	Rick Ten
Fabiano	Donna
Face	Valerie
Factor	Donna
Fahlbusch	Nadine
Fahlgren	Vivian
Falzone	Dominick
Farkas	Elizabeth
Farkas	Nolan
Farone	Ted
Farrell	Fran
Favorite	David
Favre	Thierry
Fed	Up
Fein	MD
Feingold	Emily
Feldman	Grace
Feldman	Mark
Fellner	Robin
Felsinger	Art
Felstiner	John
Ferguson	John A.
Fernandez	Cynthia
Fernandez	T.
Ferrero	Mauro
Ferris	Chas
Ferris	Michael
Ferry	Stephen
Fershin	Charlene
Fichandler	Alice
Field	Christy
Field	Mitchell
Fiflis	Michael
Figge	Donald
Figueiredo	Eva
Filipic	Randy
Fillmore	Kurt
Fink	Christine
Fink	Penelope

Last Name	First Name
Fisch	Sara
Fischella	Bob
Fish	Jason
Fish	Margaret
Fisher	Hyland
Fishman	Ted
Fitzgeral	Stan
Fitzpatrick	Robert
Flanigan	Mickie
Flannery	Marcia
Fleming	Allison
Fleming	Eric
Fleming	Mary
Fletcher	Jude
Flint	Nancy
Flitcraft	John
Flores	Herminio
Flores-Garcia	JuanCristobal
Floyd	Jennifer
Fluor	Christine
Flynn	Pierce
Fogle	David
Foley	James
Foley	Mary
Foot	Susie
Ford	Barry
Ford	Lauren
Forno	Lysia
Foster	Colin
Foster	Thomas
Foster	Genette
Fotos	Tiffany
Fowler	Steve
Fox	Gene
Fox	Roger and Betty
Fraissl	Stephanie
Franchitto	Dana
Franklin	Constance
Franzen	Ellen
Frasieur	Forest
Frauman	Laurence
Fray	Tom
Frazier	Madelynn
Frederiksen	Chris
Fredkin	Donald

Last Name	First Name
Freeborn-Rubin	Bob
Freeborn-Rubin	Mona
Freedman	Paula
Freedman	Paula
Freeman	Gregory
Freeman	Kyri
Freeman	Lena
Freeman	Mark
French	Larry
French	Pamela
Frey	Michael
Frick	Dean
Friedman	Leanne
Friedman	Mitchell
Friedman	Sarah
Fritzinger	Dennis
Frost	Diane
Frost	Martin
Frounfelter	Earl
Frumento	John
Fuchslocher	Bryna
Fuentes	Gerardo
Fukuda-Schmid	Kristina
Fularczyk	Margaret
Fulsher	Sue
Fusco	Carol Anne
Fusilier	Gilda
Futterer	Joe
Gaffney	Malcolm
Gagliardo	Pamela
Gaither-Banchoff	Kelli
Galaif	Martha
Gallagher	Glenn
Gallegos	Geoffrey
Galliano	Marco
Gallinger	Rob
Gallup	Michael
Galutza	Mayra
Galvan	Roxanna
Gamble	Sandra
Gandhi	Dipal
Gandolfi	Stefanie
Ganter	Steve
Gantos	Angela
Gantt	Robert

Last Name	First Name
Gaponoff	Sharma Lynn
Garber	Sandra
Garcia	April
Garcia	Armando
Garcia	Erin
Garcia	Jeffrey
Garcia	Rio
Garcia	Ruben
Garcia	Susan
Garcia Cucharero	Marli
Garcilazo	Fabian
Gardner	David
Gardner	Len
Garevich	Sara
Garitty	Michael
Garrecht	Jamila
Garrett	Keith
Garrett	Megan
Garrett	Tudy
Gasperoni	John
Gatto	Gina
Gavilanes	Diego
Geare	Dave
Gebhard	Eric
Gee	Telegraph
Geiser	Becky
Gelczis	Lisa
Genasci	Elaine
Gendvil	Derek
George	Catherine
George	Marvin
Gerrard	Ron
Gerry	David
Getter	Camile
Gibb	Wayne
Gibbs	Brigitte
Giese-Zimmer	Astrid
Gigles	Peggy
Gilbert	Camille
Gilbert	Sandta
Gilbertson	David
Gilchriest	Anthony
Gilkyson	Tony
Gill	Susan
Gilland	James

Last Name	First Name
Gillaspy	Linda
Giller	Tim
Gillespie	Rhiannon
Gillette	Robyn
Gingrich	Nancy
Ginsburg	Stephen
Gionet-Hawker	Celeste
Giordani	Mark
Girard	Jocelyn
Gish	W.
Glasser	Mark
Glasser	Susan
Glidden	Dianna
Gloe	Janice
Glon	Herve
Gobby	Krista
Godfrey	Teresa
Godinez	Miguel
Godinez	Nestor
Godman	Elizabeth
Goetinck	Jean
Goff	Frances
Gold	Carol
Gold	Sandra
Goldberg	Rich
Goldberg	Susan
Goldfarb	Georgia
Golding	John
Goldman	Ron
Gondell	Robert
Gongaware	Denielle
Gonsman	James
Gonzales	Diane
Gonzalez	Yazmin
Goodale	Margaret
Gooding	Luna
Goodkind	Mary
Goodmacher	Greg
Goodman	Diana
Goosey	Doug
Goral	Edward
Gordon	Keith
Gordon	Lauretta
Gordon	Michael
Gordon	Mildred

Last Name	First Name
Gorman	Laurie
Gossett	Claudine
Gossett	Sharon
Gotkowska	Ela
Gottejman	Brian
Gottejman	Brian
Gottlieb	David
Gotvald	Mark
Gould	Rachel
Gowens	Edward L.
Graffell	Jess
Gragata	Yvonne
Graham	Barbara
Graham-Graham	Rosemary
Grainger	Elizabeth
Grames	Patricia
Grant	Willa
Grascon	Jordan
Graves	Caryn
Gray	Ellen
Gray	Jim
Gray	Laura
Greaves	Denise
Greco	Tony
Green	Bernard
Green	Dee
Green	Don
Green	Eileen
Green	Jo
Green	Rhonda
Greenberg	Brittany
Greene	Jeanine
Greene	Kathryn
Greene	Matt
Greene	Anne
Greener	Carol
Greenfeld	Frances
Greenstein	Jerry
Gregoire	John
Gregorian	Arthur
Gregory	Probyn
Gregory	Ramsey
Grenard	Mark Hayduke
Gretsch	Kevin
Griffith	Clayton

Last Name	First Name
Griffith	Nancy R.
Grimes	Dr. & Mrs. James
Grimwood	Jaime
Griswold	William
Gritsch	Maria
Grizzell	James
Grobman	Bruce
Grogan	Patricia
Grone	Lori
Gronet	Richard
Gross	Anne
Guardado	Jackie
Guidi	Adriana
Guiney	Emlyn
Guise	Elizabeth
Guisinger	Tim
Gulick	Elizabeth
Gullam	Paul
Guma	Karen
Gunn	Angela
Guse	Kevin
Gustafson	Rae Ann
Guthrie	Cathy
H.	H.
Hackamack	Gayle
Hackett	Susan
Hackett	Marcia
Hadjikhani	Beverly
Hafer	Sarah
Hagens	Donna
Haggard	Alan
Haggard	Judy
Hagiu	Ioana
Hague	George
Haig	Brenda
Haig	James
Haines	Patricia
Haines	Shauna
Haines	Michael
Hair	Zera
Hale	Angela
Hale	Elizabeth
Hale	Katie
Hales	Jay
Hall	Colleen

Last Name	First Name
Hall	Kathleen
Hall	Natalie
Hall	Robert
Hall	Linnea Fronce & Thomas
Hall	Lynn
Hall	Stacy
Hallmark	Jena
Halsey	Jane
Hamel	Lyne
Hamilton	James
Hamilton	Sharon
Hammer	F.
Hammond	Stacy
Hand	Peter
Handley	Vance
Hanger	Susan
Hanks	Kim
Hansell	Jody
Hansen	Charlotte
Hansen	Claudia
Hansen	Janet
Hansen	Karen
Hanson	Kathy
Hanson	Kimberly
Hanson	Tim
Hanzich	Dorian
Hardack	Richard
Hardie	Daniel B.
Harding	Maggie
Hardwick	Barbara
Hardy	Richard
Hargleroad	Jewell
Harker	Jana
Harkins	Lynne
Harlan	Annita
Harman	Inge
Harms-Jones	Donald
Harnish	Diane
Harper	James
Harper	James
Harper	Rebecca
Harrell	Roger
Harrell	Margaret
Harrington	Michael

Last Name	First Name
Harrington-Bullock	Lynne
Harris	Brent
Harris	Shirley
Harris	Zoe
Harrison	Colleen
Harrison	Thomsa
Hart	Pete
Harte	Mary
Hartgraves	Paula
Hartman	Carol
Hartman	Nancy
Hartman	Randall
Harvey	Richard
Harvey	Marcia
Harwell	Andrew
Hasbach	Corinna
Hastings	Neil
Hastings	Susan
Hathaway	Susan
Hatton	R
Hauer	Ray
Hawkins	Amanda
Hawkins	Paula
Hawthorne	Christina
Hayes	Jennifer
Hayes	Marietta
Hayes	Randy
Hays-Gutzat	Pati
Head	Kris
Head	Susan
Healer	Genevieve
Hecht	Alicia
Heckman	Christopher
Heckman	Wayne
Hedges	Ken
Heinold	Christian
Heintz	Penny
Heinz	Robert
Heist	Roberta
Helm	Tom
Helmer	Kathleen
Hemingway-Proia	GeorgeAnn
Hench	James
Hennemuth	Gary
Hennessey	Debbie
Henriksen	James
Henry	John
Henson	Gloria
Henze	Martha
Heon	Christina
Herbert	Michael
Herman	Gene
Herman	Scott
Hermann	Larry
Hern	A.L.
Herold	Ana
Herrera	Laura
Herrington	Beverly
Hershey-Lear	Chandra
Hess	Edward
Hesselrode	Alice
Hester	J
Hewitt	Kimberly
Hicks	Leslie
Hicks	Robert
Hiestand	Nancy
Hild	David
Hildebrand	Karen
Hilker	Virginia
Hill	Frank
Hillegass	Melinda
Hilsman	Virginia
Hilts	Schuyler
Himes-Powers	Susan
Hines	Lanier
Hink	Lani
Hinkson	Jeremy
Hirsch	Deborah
Hirsch	Rifka
Hirt	Kathryn
Hochendoner	Bernard
Hockett	Mary
Hodges	Suzanne
Hoemig	G. Thomas
Hoeschler	Rebecca
Hoffman	Jeff
Hofmann	Susan
Hogan	Emily
Hogben	John

Last Name	First Name
Holley	J.
Hollier	David
Holloway	Allen
Holmen	Magnus
Holmes	Carla
Holmes	Michelle
Holmes	Virginia
Holstein	Jon
Holter	Norbert
Homan	Leslie
Hon	Will
Honeysett	Linda
Hong	Celeste
Hoople	E.
Hooson	Clare
Hopkins	Dotty
Horeftis	MaryHelen
Horn	Wesley
Horowitz	Diana
Horvath	Wanda
Horwitz	Martin
Hosea	David
House	Michael
Howard	Erin
Howard	Lynn
Howerton	Carolyn
Howsmon	Jason
Hoxie	Helen
Hredzak	Marty
Huang	Hans
Hubacek	Richard
Hubbell	Brad
Hudak	Lesley
Huddes	Shannon
Huddleston	Molly
Hudgins	Jerry
Hudgins	Richard
Hudson	Sharon
Huffman	Paula
Huggins	Roxana
Huggins	William
Humphrey	Jeff
Hungate	H Nona
Hunnicutt	Joan
Hunrichs	Paul

Last Name	First Name
Hunt	Nicole
Hunter	Elizabeth
Hunter	Shannon
Hupp	Carol
Hurd Glenn	Janine
Hurley	Kristin
Hurwitz	Jeffrey
Husoe	Erik
Hutchinson	Robert
Hutchison	Kristi
Hutton	Dee
Hydar	John & Roberta
Hydeman	Jinx
Hylton	Steve
Iaderosa	Andrea
Inigo	Carlos
Inyan	Barbara
Iosupovici	Miriam
Ip	Bonnie
Irving	David
Irving	Thomas
Irwin	Melanie
Irwin	Yvette
Isenhower	Eric
Isham	Wayne
Israelson	Linda
Iverson	Kent
Iverson	Steve
Jackson	Alicia
Jackson	Greg
Jackson	Jennifer
Jackson	Maria
Jackson	Monica
Jacob	Ronald
Jacobs	Tracy Ann
Jacobs	Tracy Annu
Jacoby	Ketzia
Jacoby	Peter
Jaime	Brenda
Jain	Paula
Jakusz	Heather
James	Romanyak
Jamieson	Peggy
Jannone	Dan
Janowitz-Price	Beverly

Last Name	First Name
Jarvis	Brad
Jarvis	Paul
Jasoni	Marilyn
Jaymes	Anjin
Jeckell	Joyce
Jeffers	Sandra
Jeffery	Karin
Jellison	Nancy
Jenkins	Jacqueline
Jensen	Donna
Jeska	Renee
Jessee	Rhonda
Jessler	Darynne
Jiobu	Laurie
Johansen	Elizabeth
Johanson II	David
Johhson	Carla
Johns	Juliet
Johnson	Audrey
Johnson	Beverly
Johnson	Carol
Johnson	Darrel
Johnson	Dwight
Johnson	Linda
Johnson	Linda
Johnson	Liz
Johnson	Marcia
Johnson	Marelyn
Johnson	Robert
Johnson	Stephen
Johnson	Teresa
Johnson	Terry Floyd
Johnson	Will
Johnson	Wayne
Johnstone	Penelope
Jolivette	Jane
Joly	Frederique
Jonaitis	Charles
Jones	April
Jones	Bradley
Jones	Brian
Jones	Carole
Jones	Hiroko
Jones	Jake
Jones	Johanna

Last Name	First Name
Jones	Julita
Jones	Sam
Jones-Bedel	Laura
Jordan	Lois
Joyce	Laurie
Jumonville	Julie
Kafer	Norma
Kafton	Pamela
Kahn	Georgia
Kallah	Zee
Kaluzhski	Alexandre
Kamath	Tara
Kampa	Jan
Kandus	Colleen
Kane	Irene
Kane	Linda
Kane	Mari
Kantor	Martin
Kapty	Patrick
Kardash	Rick
Karten	Nowell
Kast	Michael
Kastlie	Rod
Kastlie	Vickie
Kasuya	Tauny
Kathy	Compagno
Katz	Michele
Kauffman	George B.
Kaufman	Barry
Kaufman	Muffett
Kavantjas	Mia
Kawakami	Tedd
Kawecki	Lewis
Kay Foumberg	Robin
Kayan	Helmut
Kaye-Carr	Josh
Kean	Martha
Keans	Deb
Keeler	Robert
Keith	Joyce
Keith	Joyce
Kekule	Richard
Keller	Larry
Keller	Shelly
Kelly	Barbara

Last Name	First Name
Kelly	Florence
Kelly	Michael
Kelly	Nancy
Kelly	James Michael
Kelly	Alice
Kelly	Jennifer
Kelsberg	Jane
Kelsen	Kinsey
Kelsheimer	Elise
Kemenesi	Rick
Kendall	Benjamin
Kendrick	Thomas
Kenna	Aaron
Kennard	Clara
Kent	Schuyler
Kentor	Elen
Kenyon	Lucy
Kerr	Heather
Kestler	Carol
Ketcherside	Sharon
Ketterer	Marcia
Khalsa	Mha Atma S.
Khoury	Valentina
Kielarowski	Henry
Kielman	Laura
Kiley	Joan
Kimball	Barbara
Kimball	Toni
Kindig	Norman
King	Barbara
King	J.
King	Laurie
King	Jean
King	Susan
Kipers	Kevin
Kipp	Thomas
Kirby	Bettina
Kirby	Peter
Kirks	James
Kisner	Al
Kisselburg	Desiree
Kleber	Craig
Kleber	Keith
Kleber	Tracey
Klein	Chuck

Last Name	First Name
Kleine	Walt
Kleinert	Maranda
Klengler	Ingolf
Klengler	Joan
Klipfel II	George F.
Klosterman	Pete
Klucsor	Carmen
Klug	Frank
Klusman	Eric
Knapper	Karl
Knickerbocker	Deanna
Knight	Diane
Knight	Franklin
Knight	Kendra
Knight	Sandra
Knobler	Karl
Knowland	Diana
Knox	Mayumi
Koessel	Karl
Kohler	John
Kohleriter	Bonnie
Kohnken	Pam
Koivisto	Ellen
Kolpin	Kimberly
Konar	Deborah
Koo	Rebecca
Kornhauser	Samuel
Korsen	Alan
Kothari	Sheila
Kourda	Terry
Kovacs	Natalie
Krajewski	Barbara
Kramer	Dee
Kramer	Joan
Kramer	Julie
Kramer	Kelly
Kraus	Gary
Krausz	Lisa
Kreager	Anita
Krell-Bates	Diane
Kritzer	Sherry
Kroeger	Becky
Kronenberger	Kathy Lou
Krosukup	Heidi
Krull	Marcia

Last Name	First Name
Krupinski	K.
Krywko	Kevin
Kuelper	Carol
Kugelman-Kropp	Claire
Kukovich	Kara
Kumar	Chetan
Kuntze	Richard
Kurcab	Kim
Kurez-Easom	Susan
Kuticka	Sheri
Kyle	Patrice
Kyriakos	Sharon
L Engel	Wayne
La Doux	Tasha
La Mont	Erika
LaBerge	Jason
Lacey	Carole
LaFauci	Lauren
Lafaver Gleason	Barbara
LaFrance	Roberta
Lagorio	Lori
Lahr	Kenneth
Lai	Janet
Lai	Molly
Lake	Carol
Lamb	John
Lambden	Corinne
Lambert	Alan
Lamont	Juliet
Lance	Jeanne
Landau	Beryl
Landin-Erdei	Mireya
Landon	Chanel
Landon	Dominique
Landsberg	Marisa
Lane	Jana
Lane	Lama
Lane	Priscilla
LaNew	Maryann
Lange	Chris
Langenfield	Debbie
Langlois	Elaine
Lanning	Kathryn
Lanzl	Catherine
Lao	Wendy

Last Name	First Name
Lapid	Gary
LaPointe	Drena
LaPointe	Larry
Larrain	Casey
Larsen	Areil
Larsen	Jane
Larson	Elaine
Larson	Janet
LaSchiava	Dona
Lashaway	Lisa
Latta	George
Lauer	Patricia
Laughon	Char
Lauren	Cynthia
Laurita	Lori
Laursen	Seth
Laustrup	Mark
Lautaro	Gabriel
Law	Terri
Lawnicki	Timothy
Lawrence	Edward P
Lawrence	Kathleen
Lawrence	Victor
Lawson	William
Lawton	Kathleen
Laxier	Scott
Le Fevre	Dale
Le Luong	Gervais
Le Sieur	Esther
Leach	Steven
Leaf	Jonathan
Leago	Emily
Leaming	Bob
Leather	Scott
Lebowitz	Sheri
Lebrato	Mary
Ledden	Dennis
Ledesma	David
Lee	Edward J.
Lee	Eileen
Lee	Eron
Lee	Kathy
Lee	Richard
Lee	Sabrina
Lee	Summer

Last Name	First Name
Lee	Brenda
Lee	Jeanine
Lee	Roberta
Leeder	Cynthia
Lefler	Scott
Legg	Ann & Derek
Lehr	Stephanie
Leigh	Gary
Leigh	Lynda
Lempart	Lukasz
Lenier	Doug
Lennox	Gerry
Leon	Peter
Leonard	Cami
Leonard	Nick
Leske	Jim
Lesko	Alberta
Leslie	Leslie
Letizia	Mark
Leto	Florence
Letson	Cheryl
Lev	Marjorie
Levin	Michael
Levin	Phyllis
Levine	Ellen
Levine	Sandy
Levitt	Judy
Levy	David
Lewis	Cheryl
Lewis	Deborah
Lewis	George
Lewis	Ildiko
Lewis	Jan
Lewis	Maxine
Lewis	Patrick
Lewis	Ryan
Lewis	Sherman
Liao	Yang
Lichtenberger	Mark
Lightcap	James
Lilly	Susan
Lim	Kristina
Lim	Olivia
Lima	Christopher
Lin	David

Last Name	First Name
Linam	Stephanie
Lindner	Matthew
Lindsay	Jason
Lindsay	Scott
Lipkind	Lawrence
Lipson	Beverly
Lis	Vera
Liss	Gary
Liss	Janet
Lissauer	Joan
Lista	Cassandra B.
Little	Godfrey
Little	Judith
Little	Robyn
Livesey-fassel	E.
Livesey-Fassel	Elaine
Livingston	Terri
Locicero	Jessica
Loe	Peggy
Logue	Darlene
Long	Kristina
Long	Jeffrey
Looby	Judith
Looney	Ernie
Lopez	Adolfo
Lopez	Ralph
Lord	Mike
Loree	Joe
Lorenson	Ray
Lorenz	Austen
Lorenzo	Gloria
Lorig	Bob
Lorraine	Hilary
Loseke	Rachel
Loucks	Cynthia
Loughlin	Richard
Louie	Vincent
Lourie	Ann
Loveday	George
Low	Loretta
Lowe	Rob
Lowrey	Austin
Lowry	Jamie
Lozano	Luis
Lubin	Dana

Last Name	First Name
Lubitz	Iris
Lubitz	Nicolas
Lubofsky	Toni
Lucchini	Paul
Luckman	Paul
Luetkemeier	Kristen
Luff	David
Luke	Richard
Lusk	JoAnne
Lustig	Karen
Luth	Sarah
Lynch	Kelli
Lynch	Lisa
Lynn	Heidi
Lynn	Rhonda
Lynne	Franceska
Maas	Larry
Mabrey	Edd
MacAdam	Iain
MacCollom	Alex
Macdonald	Barbara
MacDonald	Jennifer
MacIntyre	Michael
MacIntyre	Michael
Mackay	Donald
Mackay	Leslie
MacKrell	Chris
Macy	Rachel
Madarasz	Paul
Maddock	Laurra
Madison	Chelsea
Madison	Mary-Carol
Madore	Tyler
Madrigal	Teresa
Madruga	Philip
Maggy	Jamie
Mahaffey	Shana
Mahan	James
Mahl	Ekhard
Maisonneuve	Mark
Maker	Janet
Maldonado	Daniel
Maletsky	Susan
Mallett	Michael
Malley	Karen

Last Name	First Name
Malmuth	Sonja
Maloney	Marcia
Maltzan	Jan
Mammon	Robert
Mande	Jace
Manley	Cynthia
Mann	Courtney
Mann	Harold
Manning	Alexis
Mannion	Maureen
Mannion	Cynthia
Marchese	John
Marcus	Martin
Marcus	Naomi
Mardesich	Daniel
Margay Burke	Bonnie
Marie	Christine
Mark	Marie
Markowski	Stephen
Marks	Joan
Markus	Mary
Marlatt	Randy
Marquez	Emilia
Marriner	Susannah
Martin	Brad
Martin	Chloe
Martin	Esther
Martin	Larissa
Martin	Susan
Martin	Timothy
Martin	William
Martinez	Jennifer
Martinez	John F.
Martinez	Keiko
Martinez	Michele
Martinez	Antonio
Martinez	Melissa
Martini	Richard
Martin-Neff	Gabrielle
Marzocchi	George
Maselbas	June
Massarotto	Francesca
Massey	Eileen
Massey	Irma
Massey	Jennifer

Last Name	First Name
Master	Ryan
Mastroianni	Anna
Masuda	Carol
Mathes	Barbara
Matheson	Meigs
Mathews	Arline
Mathys	Rita
Matlin	Thelma
Matlock	Dale
Matson	Gregg
Matsuoka	Janna
Mattes	Dale
Matthews	Charlotte
Matz	Tamara
Mauch	Rebecca
Maxson	Ronald
Maxwell	Lawrence
May	Geraldine
May	Michele
May	Marcie
Mayber	Marita
Maybury	John
Mayer	Joseph
Mayer	Marita
Mayer	Richard
Mayhew	Kimberly
Mayhew	Sarah
Mayo	Alberta
Mays	Teresa
Mazhnyy	Mark
Mazur	Alfred
Mc Vie	Christina
McAuliffe	Mary
McBride	Kathryn
McCalister	Janet
McCall Poetzl	Annie
McCamon	Liz
McCarten	Louis
McCarthy	Anne
McCleary	Elizabeth
McClosky	David
McCloud	Kalyn
McCombs	Robert
McCormick	Devin
Mccormick	Douglas

Last Name	First Name
McCormick	Douglas
Mccormick	Sue
McCorrry	Susan
McCoy	Michael
McCracken	Wendy
McCreless	Erin
McCrohan	Mary
McCulloch	Norma
McDaniel	Michael
McDermott	Sydney
McDonald	Claude
McDonald	Linda
McDonald	Pam
McDonough	Rebecca
McDowell	Tim
McDuffie	Holly
McEwen	Rebecca
McFarland	David
McGee	Maureen
McGonagle	Richard
McGregor	Cheryl
McHugh	Colin
McIntyre	Julian
McIntyre	Misty
McKay	Megan
McKee	Jerry
McKeighen	Daniel
McKenna	Caephren
McKenna	Dale
McKenna	Kendra
McKenzie	Ross
Mckenzie	Susan
McKinney	Rose
McLaughlin	Diane
McLaughlin	Michael
Mclaughlin	Susan
McLean	Kinsey
McMahan	Michael
McMahon	Anah
McMahon	Carol
McMahon	Sean
McMullen	Carole
McMullen	Gail
McMullen	Stacey
McMullen	Susan

Last Name	First Name
McNamara	Kevin
McNulty	Barbara
McQueen	Kelley
McRae Baley	Patricia
McVeigh	Patricia
McVein	Barbara J.
Meade	Pattie
Meager	Helen
Medeiros	Alexander
Medlock	Jenny
Medzihradsky	O.
Meehan	Don
Mehrotra	Rahul
Mejia	Marianna
Mello	Gilberto
Melvin	Catherine
Menard	Rose Marie
Mendenhall	Barbara
Menendez	Gabrielle
Meredith	Michael
Merkel	Alison
Merkel	Jane
Merritt	Jean
Merson	Keith
Messenger	William
Messineo	Michela
Metzinger	Karen
Meyer	Ichael
Meyer	Janice
Meyer	Twyla
Meyers	Cindy
Meyers	Eric
Meyers	Rosemary
Meza	Joel
Michelson	Golda
Milburn	Renee
Miles	Irene
Miliotis	David
Miller	Amelia
Miller	Christopher
Miller	Don
Miller	Harriet
Miller	Janet
Miller	Margretta
Miller	Nancy

Last Name	First Name
Miller	Norman
Miller	Patricia
Miller	Robert
Miller	Terry
Mills	Barry
Mimeau	Pat
Minault	Kent
Miner	Curt
Minic	Marija
Minnich	Ilene
Minor	David
Miranda	Michelle
Mitchell	Desiree
Mitchell	Ina
Mitchell	Jolina
Mitchell	Laureen
Mitchell	Mateus
Mitchell	Michelle
Mitsuda	Michael
Mittig	William
Miura	Siobhan
Miyasaka	Jeanne
Miyashiro	Marla
Mizuguchi	Naoko
Moeller	Lisa
Moeller	Michael
Moffett	Allison
Moise	Kim
Molgora	Bianca
Mombourquette	Kathy
Monahan	Moira
Mone	Carol
Monell	Mary
Monroe	Dean
Monroe	James
Mont-Eton	Jean
Moody	Moody
Moore	Hugh
Moore	Maria
Moore	Melissa
Moore	Deirdre
Moose	Mary Etta
Moose	Mary Etta
Mora	John
Moran	James

Last Name	First Name
Moran	Liana
Moran	Susan
Moran	V.
Morarre	Pam
Moreno	Albert
Morgan	Michael
Morgan	Sue
Morgenfruh	Rudolph
Morley	Norman
Morningsong	Cynkay
Morningsong	Cynkay
Morris	Cynthia
Morris	Everett
Morris	John
Morris	Ray
Morris	Steve
Morris	Alexis
Morris	Sharon
Morrison	Frances
Morrison	Marcella
Morrow	Lynn
Morrow	David
Mortensen	Richard
Mracek	Pavel
Mudge	Kathleen
Mugglestone	Lindsay
Mulcare	James
Muldaur	Maria
Mulder	Mark
Mulholland	Christine
Mulick	Jim
Mullane	Sharon
Mullen	Peter
Munce	William
Mundal	Sarah
Munoz	Jeanne
Murdosh	Sarah
Murphy	Ann-Marie
Murphy	Marcia Lee
Murphy	Betty
Mursch	Jeanne
Murti	Vasu
Mutascio	Robert
Myers	Derald
Myers	Nathan

Last Name	First Name
Nachlinger	Sylvia
Nadolski	Jessica
Nafziger	Nikki
Nagy	James
Nakata	James
Nantel	Vivianne
Nape	Clarice
Napolitan	Elaine
Nass	Thomas
Nast	C.
Natseway	Pat
Navarro	Greg
Navez	Ren
Neal	Warwick
Neal	Yvonne
Nealon	Sandra
Nelson	Marisa
Nelson	Miesen
Nelson	Nanci
Nelson	Scott
Nesbitt	Lynda
Ness-Lira	Carole
Neste	Lisa
Nesvadba	Fallon
Neuhauser	Alice
Newman	Michael
Newsham	Don
Newton	Roger
Ng	Carol
Nghiem	Nghi
Ngo	Ann
Nguyen	Binh
Nguyen	Vy
Nichols	Carmen
Nichols	Richard
Nicholson	Julie
Nickels	Jeanette
Nickum	John
Nicole	Anastasia
Nicoll	Michelle
Nielsen	Gregory
Nierman	GL
Nikolich-Zugich	Tijana
Nilles	Laila
Nillo	Christina

Last Name	First Name
Nishio	John
Nola	Robert
Nola	Michael
Nolan	Katherine
Noone	Molly
Noonkester	Dale
Noordyk	James
Nordahl	Richard
Notary	Kim
Notestine	James
Notkin	Debbie
Novak	Ken
Noyes	Daniel
Nunez	Carlos
Nunez	Rogelio
Nystrom	Barbra
Obando	Oscar
Obershaw	Lynda
Obyrne	Cynthia
Ochoa	Joan
Ochoa	Victor
O'Connell	Mary
O'Connor	MaryRose
Oda	John
Odelberg	Bruce
Odell	Norma
Oldham	Jan
Oliver	Kathryn
Oliver	Tom
Ollar	J. J.
Olsen	Donna
Olson	K.
Olson	Jinx
O'Malley	Polly
Omorenimwen Oboruemuh	Abraham
O'Neill	Cara
Oniell	Adrienne
Opera	Cleo
O'Rafferty	Eric
O'Reilly	Brian
Oriotis	Cassandra
Oriotis	Cassandra
Orlinski	Patricia
Oroz	Michelle

Last Name	First Name
Orozco	Steven
Orsary	Stephen
Osborne	Jessie
Oser	Wendy
Oshea	Maureen
Osterhoudt	David
Otero	Gloria
Otha Wolfenden	James
Overmann	Laura
Owen	Julie
Owens	Cindy
Paddock	Shelley
Padelford	Grace
Padgett	Lenay
Padmanabhan	Urmila
Palacio	D.
Palacio	Diane
Palermo	Michael
Palladine	Michelle
Palmer	Francis
Palmer	Kirstie
Palmer	Michelle
Palo	Margaret
Paltin	Sharon
Palumbo	E
Paniagua	Rosiris
Pann	Robert
Pantalone	Arlene
Papakonstandinou	Eleni
Pardini	Jennifer
Pardo	Daniela
Paris	Melina
Park	Jason
Park	Samuel
Parker	Anna
Parker	David
Parker	Elaine
Parker	Marie
Parks	Lisa
Parlette	Karen
Parreira	Stephanie
Parrish	Joan
Parrish	L
Parsons	Ron
Parzick	Anne

Last Name	First Name
Pasqua	John
Patterson	Ellen
Patterson	Kevin
Patti	Vincent
Patton	James
Patton	Lisa
Paul	Tanya
Paul-Almand	Nicole
Pavlidis	Gregory
Pedersen	Annette
Pekarcik	Diane
Pekin	Patrick
Pellicani	Andrea
Pelton	B.
Peluso	Josie
Pena	Suzanne
Pendrey	Deborah
Pennington	Heather
Pennington	Kenneth
Penunuri	Daniel
Perdios	Dan
Perisco	Yuka
Perkins	Anne
Perlman	Janet
Perrie	Martha
Perry	David
Perry	Lee
Perry	Leslie
Perry	Philip
Perryman	Jo-Ann
Persky	Jerry
Perszyk	Kim
Petel	Amanda
Peter	Williamson
Peters	Felicia
Peters	Freya
Peters	Susan
Peters	William
Peterson	Nancy
Peterson	Stanley
Petlock	Kyle
Petranto	Nancy
Pettey	Corinne
Pettis	Carolyn
Pettit	Sylvia

Last Name	First Name
Phelps	Tami
Phillips	Bob
Phillips	Kimberly
Phillips	Marilyn
Philllils	Jim
Phipps	Maria
Phung	Anne
Picciani	Laureen
Pichel	Vanna
Pielenz	Christine
Pielke	Janet
Pierce	Deborah
Pierna	Lisa
Pierre	Amy
Pierson	Dana
Pierson	Cassandra
Pineda	Jacqueline
Pinson	Ed
Piotrowski	Pauli
Pirch	Charlotte
Pitchford	Jayne
Pitchford	Victoria
Pitsker	Peter
Pitton	Helen
Platter-Rieger	Mary F.
Plaza	Minette
Plummer	Lewis
Plummer	Pam
Polansky	Debra
Polick	Melissa
Polish	Bret
Pollock	Jeri
Pomies	Jackie
Poncia	Beverly
Pope	Karen
Popp	David
Poppie	Frank
Porcellino	Ana
Porritt	Aponi
Porter	Dean
Porter	Kenneth
Portocny	Andrea
Posner	Susan
Potts	Catherine
Potts	Graeme

Last Name	First Name
Pousman	Robert
Povill	Jon
Powell	Regina
Powers	Gypsy
Powers	Laurel
Powers	Pam
Pratt	Lynne
Prax	Ken
Prchal	Steven
Preston	Astrid
Preston	Lynne
Prete	Michael
Price	Joan
Prince	Vicki
Prince	Winthrop
Priskich	Fiona
Pritchard	Jennifer
Prochazka	Penelope
Proctor	Stephanie
Proper	Kenneth
Prosser	Andy
Proteau	Mary
Provencher	Lauri
Pryputniewicz	Stephen
Puaoi	Richard
Public	Joe
Public	Joe
Purvis	Russ
Putz	Brad
Quadros	John
Quanstrom	Julie
Quellas	Matthew
Quigley	April
Quijano	Nikkelley
Quilici	Lauren
Quiroga	Estrella
R.	Cat
Rabb	Leslie
Rabbino	Michael
Rachmuth	Marc
Racine	Robert
Racobs	Richard
Radamaker	Theodore
Radford	Nancy
Rae	Judie

Last Name	First Name
Raible	Annette
Raider	Phil
Raim	Leila
Ralston	Jeannette
Ramon	Alberto
Ramos	Paul
Ramsden Scott	Sidney
Ramsey	Elizabeth
Randolph	Dee
Ranger	Michael
Rankin	Roxanne
Ranz	Lauren
Rarden	Ann
Rasor	Margaret
Rathbun	James
Ratliff	Peggy
Ratzlaff	Karen
Ray	Thomas
Reade	Anne
Reading	Jane
Reading	Roger
Reagan	Russell
Reback	Mark
Rebb	Karen
Redish	Maryellen
Reece	Monique
Reed	Rodger
Reel	Joseph
Reese	Gary
Reese	Drew
Rego	James
Reichert	Susan
Reid	Brian
Reid	Donna
Reifer	Jane
Reiley	Marcial
Reimer	Peter
Reinertson	TC
Reinhart	Kimberly
Reinhart	Robin
Reitmajer	Michelle
Renee	Nina
Rennacker	Ann
Renner	Randy
Reskof	Geraldine

Last Name	First Name
Reyes	Eric
Reynolds	Gloria
Reynolds	Judy
Rhein	Robert
Rhew	D
Rhoads	Gladys
Rhodes	Janet
Riber	Genevieve
Ribiat	Daniel
Riblett	Mary
Rice	David
Rice	Jay
Richardson	Joan
Richmond	Lonna
Richter	Donald
Ridder	Catherine
Rideout	James
Riedel	Randy
Riehart	Dale
Rietzel	Marilyn
Rigas	Dina
Riggs	Brent
Riggs	Kristin
Riggs	Vincent
Riley	Callie
Riley	John
Riley	Nancy
Rinaldi	Zorine
Rios	Jen
Rip	Nichole
Rippey	Kathleen
Risdon	Russ
Riskin	Ron
Risso	Alisa
Ritchie	Shann
Rivera	Joe
Rizvi	Akbar
Roach	Sally
Roark	John
Robbin	Barbara
Roberson	Patricia
Robert	Lance
Roberts	Gail
Roberts	Janet M.
Roberts	Julie
Roberts	Les
Robertson	Chris
Robey	Eddy
Robey	Steve
Robins	Rick
Robinson	Helene
Robinson	Jacqueline
Robinson	Mick
Robinson	Naeda
Robinson	Tom
Robles	Sidney
Rocco	Priscilla
Roche	Maureen
Roch-Levecq	Anne-Catherine
Rodine	Jean
Rodine	Jean
Rodoff	Lennie
Rodrigues	Sharon
Rodriguez	Mary
Roe	Christina
Roe	R. Richard
Roebuck	Gregg
Roeder	Randolph
Rogalin	Suzanne
Rogat	Al
Rogers	Celeste
Rogers	David
Rogers	Margaret
Rogers	Susan L.
Rohrbaugh	Stacey
Rohrer	Laurel
Rojeski	Mary
Rollins	Sharon
Rollins	Sue
Romanowski	Scott
Romberger	Cynthia
Romero	Sydney
Romesburg	Denise
Rookhuyzen	Van
Rooney	Diane
Root	Charlene
Root	Jessie
Rosenblatt	Roxanne
Rosenblood	Jamie
Rosenblum	Stephen

Last Name	First Name
Rosenfeld	Samuel
Rosensimon	Barbara
Ross	Darlene
Ross	Erin
Ross	George
Ross	Kimberly
Rosser	Grif
Rossi	M.
Rossi	Ray
Rotcher	Michael
Roth	Diane
Roth	Doris
Roth	Jerome
Rothafel	Dort
Rowe	Susan
Rowoth	J.
Rubel	Scott
Rubicam	Shannon
Rubin	Michael
Rudin	K.
Ruiz	Danielle
Ruiz	Kathleen
Ruiz	Raul
Russell	Bob
Russell	Dianne
Russell	Linda
Russell	Patrick
Russell	Patrick
Rust	Tom
Ruster	Bert
Ruwe	Ben
Ryan	Jo Ellen
Ryan	Paul
Ryan	Therese
Rynkiewicz	Mary Lou
S	Svetha
Saar	Dolores
Saban	Don
Sabo	Betty
Sadler	Darla
Sagatelian	Nancy
Saint-Amour	Jeanne
Salama	Mo
Salamanca	Lena
Salas	Jan

Last Name	First Name
Salazar	Alicia
Salenger	Cathy
Salerno	Lou
Salerno	Marie
Salido	Robert
Sall	Gloria
Saltzman	Barry
Sams	James
Samuels	Pearl
San Miguel	Pamela
Sanchez	Cristina
Sanchez	Paul
Sanchez	Ralph
Sanchez	Sibyl
Sanderfer	Michael
Sanders	Gary
Sanders	M.
Sanders	Ralph
Sanderson	Reed
Sandoval	G
Sands	Adele
Sansone	VR
Santangelo	Phillip
Santangelo	Stephen
Santone	Deborah
Sarabia	Michael
Sardellitto	Peter
Sarris	Dorian
Sato	Nancy
Saue	Lucinda
Sauer	John
Saunders	Robert
Saunders	Stacy
Saussol	Bonnett
Savage	Alice
Savage	Patricia
Savich	Sophia
Savoia	Jo-Ann
Sawyer	Lynn
Sawyers	Carol
Scanlon	Shiva
Scarborough	Deborah
Scarpati	Rodolfo
Schachter	S.
Schaefer	Jim

Last Name	First Name
Schaeffer	Lorraine
Schaffer	Kim
Schairer	Karen
Schandall	Rami
Scharlack	Meyer
Schechtman	Barry
Schegloff	Myra
Schehl	Ed
Schellhous	Les
Schenck	Alan
Scherzer	Teresa
Schiffer	Marcia
Schiffman	Lauren
Schilling	Christy
Schimaneck	Michael
Schlecker	Rose
Schleimer	Sylvia
Schlesinger	Susie
Schlesinger	Susie
Schlinger	Henry
Schmid	Linda
Schmidt	Diana
Schmidt	Ann E.
Schminke	Molly
Schmitt	Walter
Schmitz	Heidi
Schneider	Sarah
Scholz	Ernest
Schorre	Dewey V.
Schott	Rosann
Schottlaender	Sherri
Schramm	Beatrix
Schriebman	Judy
Schuessler	Betty
Schuhrke	Nancy
Schulman	Leah
Schultz	Ashley
Schultz	Lesley
Schulze	Albert
Schuman	Richard
Schuster	J.
Schutt	Ashley
Schutte	Ron
Schutz	Ama
Schwab	Ann

Last Name	First Name
Schwartz	Alan
Schwartz	Don
Schwartz	Florence
Schwartz	Jake
Schwartz	Rich
Schwarz	Axel
Scott	Andrea
Scott	Harlan
Scott	Kari Lorraine
Scott	Lorna
Scott	Thomas
Scott	Nadine
Scotti	O. Bisogno
Scoville	Karen
Seaborg	Da ve
Seamon	John
Searles-Wilson	Wendy R.
Sears	Steve
Seaton	Chris
Sebastian	Joseph
Seekamp	Edward
Seekatz	Russ
Seeley	J
Seeley	Marsha
Seelig	Erica
Seeman	Carolyn
Segal	Mara
Seidenberg	Ariella
Seil	Fredrick
Seligman	William
Selken	Laura
Sellars	Stefanie
Sellers	Jennifer
Selover	Peg
Selten	Vic
Seltzer	Rob
Senegal	Aaron
Senour	Jon
Sepulveda	Christine
Serota	Michael
Severn	Percy
Seyfried	Mike
Shah	Omar
Sharee	Donna
Sharp	Kathy

Last Name	First Name
Shaw	Christine
Shaw	Marianne
Shaw	Susan
Sheets	Gabriel
Sheldon	Sher
Shepard	Dodie
Shepherd	Marilyn
Shepherd	Melanie
Shepherd	Melinda
Sheppard	William
Shere	Lindsey
Sheridan	Lenore
Sheridan	Marlene
Sherman	David
Sherman	Nina
Sherrill	T
Shiels	Laurie
Shilder	Mary
Shinder	David
Shipper	Sander
Shirley	Aida
Shively	John
Shook	Philip
Shook	Somer
Shoop	Karen
Shore	Brad
Shore	Garrett
Shores	Michael & Kathy
Shrader	Gregory
Shrum	Kenneth
Shubert	Lois
Shulda	Chris
Shulda	Vincent
Shuler	Heidi
Shulman	Joseph
Shuster	Marguerite
Sibary	Kay
Sickel	Kimberly
Sigel	Liz
Sigretto	Norma
Silan	Sheila
Silkey	Ulrike
Silva	Naomi
Silverio	Alexander
Silverman	Judy

Last Name	First Name
Simmons	Adrienne
Simmons	Ed
Simon	Brenda
Simon	Philip
Simonian	Thomas
Simons	Anita
Simpson	Eric
Simpson	Eric
Simpson	Kim
Sims	Amber
Sims	Donna
Sinacore	Paul
Singh	Bobby
Singh-Bowman	Nan
Singleton	Therese
Sipes	Loni
Siponen	Birgitta
Sircar	Subrata
Sirley	David
Siskron	Catherine
Sislin	Leno
Sitnick	Joan
Sittig	Tracey
Siwek	K
Skinner	Richard
Skwara	Alexandra
Slater-Giglioli	Julie
Slauson	Kevin
Slavik	Robert
Slawson	Dana
Sloneker	Sam
Smart	Wesley
Smith	Anne
Smith	Barbara
Smith	Barbara
Smith	Bret
Smith	Brittany
Smith	Cynthia
Smith	David A.
Smith	Deanna
Smith	Dennis
Smith	Grant
Smith	Indira
Smith	Julie
Smith	Kimberly

Last Name	First Name
Smith	Madeleine
Smith	Nancy
Smith	Nathan
Smith	Nicole
Smith	Randall
Smith	Richard
Smith	Scott
Smith	Lawrence
Smith	Shane
Smith-Clark	Stacey
Snyder	Sara
Snyder	Sara
Soens	Alison
Sogorka	Amber
Sohn	Marsha
Soligo	Piero
Somkin	Anthony
Sonnenblick	Rachel
Sonoquie	Monique
Soraghan	C.
Soria	Peter
Soria	Susan
Sosa	Gabriela
Soto	Lilvia
Soto	Monica
Sousa	Amanda
Souza	Michael
Spafford	Andy
Spanski	Linda
Sparks	Rick
Spence	Kathryn
Spencer	Aaron
Spencer	Jeremy
Spencer	Gayle
Sperry	Adam
Spinks	Dollie
Spivak	Howard
Spoon	Leslie
Sproat	Jan Lee
Srygley	Jane
St Clare	Simone
St. John	Lynne
Stampalia	Tom
Standard	Steven
Stanley	Norm

Last Name	First Name
Stansberry	Cheryl
Stanton	Tom
Stark	Mary
Staton	Carrie
Steadmon	Jason
Steck	Sara
Steele	Brad
Steele	Cheryle
Steele	Karen
Steele	Karen
Steele	Karen
Steffen	Eric
Steffen	Wayne
Steffes	Wayne
Steiger	Bonnie
Steinhart	Peter
Steinitz	George
Stengle	Valarie
Stenoien	Marilynn
Stephan	Dorothea
Steponaitis	John
Stepp	Jenni
Stevens	Andrea
Stevenson	Douglas
Stewart	Catherine
Stewart	Eriksen
Stewart	John
Stewart	Julia
Stewart	Renell
Stewart	Robert
Stewart	Glenn
Stickle	John D.
Stidham	Jean
Stidham	Jean
Still	Holly
Stitt	Linda
Stock	Sandra
Stocker	Thomas
Stockstill	Rob
Stoecken	Diane
Stolzenberg	Rita
Stone	Jeffrey
Storace	Michelle
Stover	Sandra
Strange	Maleada

Last Name	First Name
Strassell	Mary
Stratton	Jewels
Strickland	Dylan
Strickland	Olga
Stroud	Briana
Stroup	Will
Strugatsky	Vladimir
Sturgeon	Catherine
Suarez	Dianna
Suarez	Juan
Suchecki	Carol
Sugarman	Kathy
Sullivan	Edward
Sullivan	Val
Sultar	Joanne
Sumiyoshi	Jennifer
Summar	Patrick
Summers	AJ
Summers	Kathryn
Summers	Steve
Suri	Dipa
Surratt	Ryan
Sutherland	Hugh
Sutton	John
Sutton	John
Sutton	Joseph
Suyehara	Erin
Suzuki	T.
Svendsen	Julie
Swanson	Anne
Swartz	Kathryn
Sweetland	Karen
Sweetling	William
Swift	Allen
Swift	Monica
Switalla	James
Swoiskin	Mark
Syed	Mushtaq
Sympson	Marisa
Szabo	Joseph
T.	Meggie
Tabachnick	Kenneth
Tabb	Linda
Tabor	Linda
Taerbaum	Jody

Last Name	First Name
Taft	Barry
Talamo	David
Talbot	Jacques
Talley	Charles P.
Tamburri	Nick
Tamoto	Jan
Tanimura	Pam
Tanz	Michael
Tapia	Rafael
Tarlow	Kathleen
Tarquino	Georgina
Tasher	Joanne
Tasker	David
Tasoff	Jack
Tassone	Louise
Tate	Leslie
Taylor	Deborah
Taylor	Emily
Taylor	Jeff
Taylor	Tim
Tedesco-Kerrick	Terry
Teevan	John
Tegland	Ormand
Tello	Lupita
Templeton	Sara
Tenenbaum	Debbie
Tenn	Cynthia
Tera	Rapp
Terriquez	Erika
Terry	Derrick
Terry	Justin
Terry	Michael
Terry	Terelle
Teunissen	Christina
Tews	Thomas
Thayer	Jeff
Thing	Susan
Thirouin	Kim
Thomas	Debbie
Thomas	J.
Thomas	James
Thomas	Jennifer
Thomas	Karen
Thomas	Toni
Thomas	Thais

Last Name	First Name
Thompson	Jackie
Thompson	Sandra
Thompson	Stacy
Thomsen	Don
Thorbjornsen	Brian
Thorpe	Naomi
Throndson	Jan
Thronton Sr.	Ernie
Thryft	Ann
Thurman	Andrea
Thurstjon	Julie
Tiarks	Daniel
Tice	Paula
Tichman	Nadya
Tidwell	Amber
Tilden	Margaret
Tilley	Justine
Tipper	Barbara
Tkach	Bill
Tkatch	Susan
Tomasello	Pela
Tomczyszyn	Michael
Ton	Tung
Toobert	Michael
Topping	Jeff
Torre-Bueno	Ava
Torres	Mayra
Torrisi	Sharon
Towers	Gloria
Towers	Patricia
Townsend	Carlos
Townsend	Chad
Toyohara	Karen
Tracey	Teri
Traer	Nancy
Trainer	Jon
Tran	Kim
Trapp	Gene R.
Travis	Annabelle
Treece	Michael
Trembly	Dennis
Trevillian	Linda
Tripp	Anthony
Tripp	Wendy
Tucker	Mark

Last Name	First Name
Tucker	Veronica
Tull-Bell	Paul
Tung	Aiting
Tuomi	R.G.
Turek	Gabriella
Turner	Jake
Turner	Kelly
Turner	Scott
Turner	Dennis
Turner	Janet
Turney	Pat
Turrentine	Rogers
Tyler	Steve
Tyroler	S.
Uditsky	Myrna
Ulring	Karen
Ungar	Luci
Unruh	Cindy
Utzig Jr.	Albert
V	Jason
Va	Jackie
Vadopalas	Erika
Valdez	Patricia
Valdivia	Susan
Valencia	Richard
Valentine	Karen J.
Vallero	Daniel
Van Hook	Chris
Van Houten	Corinne
Van Kampen	Art
van Thiel	Mathias
Van Velson	Nathan
Van Zandt	Elizabeth
Vance	Eric
Vancompernolle	Geert
Vandeman	Mike
Vanderbush	Terry
Vanderleelie	Roy
Vandyke	Marlene
Vann	James
Vare	Sandi
Varvas	Jason
Vazquez	Evelyn
Vega	Elinor
Velasco	Steve

Last Name	First Name
Veliz	Lisa
Vella	Kent
Veloz	Amy
Veraldi	Anne
Verdugo	Debbie
Vesely	Sakura
Vesperman	Gary
Vetrie	Julia
Viken	Barbara
Villodas	Abigail
Vipond	Mathew
Visani	Simona
Visperas	Carlene
Visscher	William
Vlacich	Amy
Vollmer	Alex
von Alten	Bruce
von Kluge	Karen
Vosburg	Robin
Vossoughi	Siamak
VrMeer	Janice
Vu	Nguyen
Wagner	Dean
Wagner	Mark
Walcutt	Margaret
Wald	Johanna
Walkder	David
Walker	Angela
Walker	Aurea
Walker	Barbara
Walker	David
Walker	Jason Michael
Walker	Laura
Walker	Verla D.
Wallace	Amber
Wallace	Ken
Wallace	Margaret
Wallace	V.R.
Wallace	Victoria
Wallace	Victoria
Wallach	Aleta
Wallach	V.
Wallack	John
Wallaert	Karen
Waller	Jill

Last Name	First Name
Waller	Paul
Walls	Karen
Walp	Susan
Walrafen	Barbara
Walton	John
Ward	Albert
Ward	Lyn
Warenycia	Dee
Waring	Dawn
Warner	Brett
Warner	Tim
Warr	Harvey
Warren	Craig
Warren	Ronald
Warwick	Scott
Watkins	Anita
Watkinson	Carolyn
Watson	Fran
Watson	Laurel
Watts	Nancy
Watwood	Alan
Waybur	Anne
Wdowinski	Gila
Weamert	Sarah
Webber	Patricia
Weber	Helen
Weber	Jamie
Wedel	Eric
Weid	Magan
Weigand	Edward
Weikel	Wendy
Weinberg	Ron
Weinberg	Henry
Weinberger	Mark
Weiner	Nona
Weiner	Peter
Weinstein	Lola
Weinstein	Melanie
Weiss	Abigail
Weiss	Jeremy
Weissbuch	Ellen
Weissburg	Robert
Weisser-Lee	Melinda
Weisz	Russell
Weitz	Scott

Last Name	First Name
Welch Lasken	Joanna
Welling	Jeanette
Wells	Barbara
Wells	Erin
Wellsted	B.
Wendell	John
Werner	Kirstyn
Werner	Shirley
Wesley	Susan
Whalen	Shirley
Wheeler	Mariko
Wheeler	Pearl
Whetstine	Linda
White	Dawn Marie
White	Evan
White	Jean
White	Kat
White	Michael
White	Mindi
White	Roberta
White	Vilma
Whitehouse	Judy
Whittenburg	Sherri
Whitton	Erika
Wickham	Jonas
Wieland	Chuck
Wightman	Richard
Wilbraham	Derek
Wilder	Jenny
Wilkin	Sue
Wilks	Terri
Will	Jennifer
Williams	Angie
Williams	Christina
Williams	Ian
Williams	Jayna
Williams	Kimberley
Williams	Michelle
Williams	Pat
Williams	Sara
Williams	Sara
Williams	Timothy
Williams	Wini
Williams	Catherine
Williams	Brigida

Last Name	First Name
Williams-Gboizo	Maxine
Willis	Cheryl
Willis	Jennifer
Wills	Dorothy
Wilner Stack	Trudy
Wilson	Dave
Wilson	Dina
Wilson	James
Wilson	Ken
Wilson	Michael
Wilson	Patricia
Wilson	Pete
Wimp	Amy
Winchell	Peggy
Windrum	Ken
Winegrad	Bernard
Winget	Mike
Winholtz	Betty
Winkler	Carol
Winn	Debora
Winnick	Joie
Winston	Alan
Wise	Steven
Wishingrad	Barbara
Withers	Emily
Witsell	Peggy
Witte	Jennifer
Wittl	Wendy
Wobus	Elizabeth
Woersching	Marc
Wolf	Donald
Wolf	Kristina
Wolf	Rachel
Wolf	Anne
Wolfe	Bonny
Wolfe	Charles
Wolfe	Gerry
Wolff	Liza
Wolfram	Patricia
Wolfson	Toni
Wollaston	Timothy
Wollman	Issac
Wollman	Michael
Wong	Liana
Wood	Larry

Last Name	First Name
Wood	Lauren
Wood	Marilyn
Wood	Monica
Wood	Stephanie
Wood	Dianna
Woodard	Jud
Woods	Dana
Woods	Jan
Woods	Rory
Woods	Tansy
Woolery	Alex
Woolmingotn Meriville	Jacki
Work	Jo-Ann
Worley	David
Wornum	Claudia
Woudstra	Gerrit
Wright	Cory
Wright	Dale
Wright	Elizabeth
Wright	Georgina
Wright	Madeline
Wyse	Sheila
Xavier	Marjorie
Yamashita	Fujiko
Yanko	Delores
Yao	Judy
Yap	Alberto
Yean Lim	Yee
Yeboah	Katherine
Yerkey	David
Young	Jo
Young	Lowell
Youngerman	George
Youngerman	Lisa
Yusavage	Marianne
Zadaca	Joy
Zamora	Esther
Zamora	Rae
Zampieri	Janet
Zatkin	Dalia
Zeiger	Felicia
Zeller	Rudy
Zelmanovich	Silvana
Zelmanovich	Sivana

Last Name	First Name
Zelner	Michael
Zelter	Daniel
Zelus	Marsha
Zemanek	Bill
Zenker	Elizabeth
Zerzan	Paula
Ziemer	Rosa
Zimmer	Arlene
Zimmerman	Helene
Zimmermann	John
Zunigae	E.
Zurfluh	Philip
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